Status of the Arctic Grayling and Northern Pike Sport Fisheries in the Brabant Island - Beaver Lake Area of the Mackenzie River, Northwest Territories

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April 1980

Canadian Manuscript Report of Fisheries & Aquatic Sciences No.1553

Government of Canada Fisheries and Oceans
Gouvernement du Canada Pêches et Océans

2008-06010/

Canadian Manuscript Report of
Fisheries and Aquatic Sciences
No. 1553

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by

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This is the 20th Manuscript Report
from the Western Region, Winnipeg

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Cat. no. Fs 97-4/1553 ISSN 0706-6473

TABLE OF CONTENTS

	Page
ABSTRACT/RESUME	v
INTRODUCTION	1
Study area	1
The fishery	1
MATERIALS AND METHODS	2
Creel census	2
Biological sampling	2
Aging and data analysis	2
RESULTS	2
Creel census	2
Biological investigation - Arctic grayling	3
Size composition	3
Length-weight relationship	3
Age composition	3
Growth	3
Mortality	3
Sex ratio and maturity	4
Biological investigation - Northern pike	4
Size composition	4
Length-weight relationship	4
Age composition	4
Growth	4
Mortality	4
Sex ratio and maturity	5
DISCUSSION	5
RECOMMENDATIONS	7
ACKNOWLEDGMENTS	7
REFERENCES	7
APPENDIX	26

LIST OF FIGURES

Figure		Page
1	Map of the upper Mackenzie River showing the Brabant Island and Beaver Lake areas	
2	Map of the Brabant Island area showing the location of Brabant Island Lodge	11
3	Length-frequency distributions for Arctic grayling caught by angling from the Brabant Island area, 1965-78	12
4	Age-frequency distributions for Arctic grayling caught by angling from the Brabant Island area, 1965-78	13
5	Average growth rates for male and female Arctic grayling from the Brabant Island area, 1965-78	14
6	Comparison of average growth rates (length vs. age) for Arctic grayling from the Brabant Island area to other populations in North America	15
7	Catch curves for angled Arctic grayling from the Brabant Island area, 1965-78	16

LIST OF FIGURES cont'd

Figure		Page
8	Length-frequency distributions for northern pike caught by angling from the Beaver Lake area, 1972-78	17
9	Age-frequency distributions for northern pike caught by angling from the Beaver Lake area, 1972-78	18
10	Average growth rates for male and female northern pike from the Beaver Lake area, 1972-78	19
11	Comparison of average growth rates (length vs. age) for northern pike from the Beaver Lake area to other populations in North America	20
12	Catch curves for angled northern pike from the Beaver Lake area, 1972-78	21

LIST OF TABLES

Table		Page
1	Summary of information pertaining to the fishing season and creel census period by year for the Brabant Island and Beaver Lake areas, 1972-78	22
2	Summary of catch and effort information obtained during creel census operations in the Brabant Island and Beaver Lake areas, 1972-78	22
3	Summary of harvest estimates for Arctic grayling and northern pike caught by angling from the Brabant Island and Beaver Lake areas, 1972-78	23
4	Length-weight relationship statistics for Arctic grayling caught by angling from the Brabant Island area, 1965-78	24
5	Annual mortality rates for Arctic grayling caught by angling from the Brabant Island area, 1965-78	24
6	Length-weight relationship statistics for northern pike caught by angling from the Beaver Lake area, 1972-78	25
7	Annual mortality rates for northern pike caught by angling from the Beaver Lake area, 1972-78	25

LIST OF APPENDIX TABLES

Table		Page
A-1	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1965 (Bishop 1967)	26
A-2	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1966 (Bishop 1967)	27
A-3	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1972 (Falk and Gillman 1974)	28

LIST OF APPENDIX TABLES cont'd

Table		Page
A-4	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1973 (Falk and Gillman 1974).	29
A-5	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1977 (RRCSL 1978)	30
A-6	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1978	31
A-7	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1965-78	32
A-8	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1966 (Bishop 1967)	33
A-9	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1966 (Bishop 1967)	34
A-10	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1972 (Falk and Gillman 1974).	35
A-11	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1973 (Falk and Gillman 1974)	36
A-12	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1977 (RRCSL 1978)	37
A-13	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1978	38
A-14	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1965-78	39
A-15	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1972 (Gillman and Dahlke 1973).	40
A-16	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1973	41
A-17	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1977 (RRCSL 1978)	42
A-18	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1978	43
A-19	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1972-78	44
A-20	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1972 (Gillman and Dahlke 1973)	45
A-21	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1973	46
A-22	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1978	47
A-23	Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1972-78	48

ABSTRACT

Falk, M.R., and D.V. Gillman. 1980. Status of the Arctic grayling and northern pike sport fisheries in the Brabant Island - Beaver Lake area of the Mackenzie River, Northwest Territories. Can. MS Rep. Fish. Aquat. Sci. 1553: v + 48 p.

Arctic grayling and northern pike in the Brabant Island-Beaver Lake area of the Mackenzie River, Northwest Territories, were studied during June and July, 1978 to assess the status of the sport fishery and to determine the effectiveness of a 356 mm minimum size limit for grayling which was imposed in 1974. Angler success was 1.9 grayling and 2.9 pike per angler-hour. Total harvests were estimated to be 1419 grayling (1195 kg) and 2126 pike (8876 kg). For Arctic grayling the mean length was 424 mm, mean weight was 842 g and mean age was 6.8 yr. Northern pike averaged 820 mm, 3798 g and 10.4 yr. Results of the 1978 program are presented and compared to 1965-77 data from the area.

The size of angled grayling in the trophy category (>356 mm) from the Brabant Island area increased since the adoption of the size limit. Pike are reported to have declined in size since the 1950's but with the exception of the disappearance of fish over 1100 mm after 1972 they exhibited similar size characteristics from 1972 to 1978. The total harvest of Arctic grayling from 1978 approximated previous levels while that for northern pike increased considerably.

Management strategies appropriate to the long-term maintenance of a trophy fishery for grayling and pike in the Brabant Island and Beaver Lake areas are discussed and recommended.

Key words: angling; catch composition; catch/effort; sport fishing statistics; exploitation; fishery management; population structure; size-limit regulations; spawning.

RESUME

Falk, M.R., and D.V. Gillman. 1980. Status of the Arctic grayling and northern pike sport fisheries in the Brabant Island - Beaver Lake area of the Mackenzie River, Northwest Territories. Can. MS Rep. Fish. Aquat. Sci. 1553: v + 48 p.

On a étudié, en juin et juillet 1978, l'ombre arctique et le grand brochet de la région du Brabant Island et du Beaver Lake dans le réseau du Mackenzie River, Territoires du Nord-Ouest, afin d'évaluer la situation de la pêche sportive et de déterminer l'ombre arctique, imposée en 1974. Les pêcheurs sportifs ont capturé 1,9 ombre arctique, imposée en 1974. Les pêche. Le total des prises s'élève à environ 1419 ombres arctique (1195 kg) et 2126 brochets (8876 kg). Dans le cas de l'ombre, la longueur moyenne était de 424 mm, le poids moyen de 842 g et l'âge moyen, de 6.8 ans. Pour le brochet, les données similaires sont de 820 mm, 3798 g et 10.4 ans. Les résultats du programme de 1978 sont présentés et comparés aux données de 1965 à 1977 pour la même région.

La taille des prises d'ombre arctique dans les lacs à trophée (>356 mm) du Brabant Island a augmenté dupuis l'adoption de la limite de taille. Celle du brochet, par ailleurs, aurait diminué depuis les années 1950 mais, à part la disparition de prises de plus de 1100 mm après 1972, les caractéristiques de taille ont été à peu près semblables de 1972 à 1978. Le total des prises d'ombre arctique en 1978 était comparable aux niveaux précédents, tandis que celui des prises de grand brochet a augmenté considéerablement.

Les programmes de gestion appropriés au maintien à long terme de la pêche de l'ombre arctique et du brochet dans les lacs à trophée de la région du Brabant Island et du Beaver Lake sont étudiés et des recommandations sont indiquées.

Mots-clés: pêche à la ligne, composition des prises; prises/effort; statistiques de la pêche sportive; exploitation; gestion de la pêche; structure de la population; réglementation de la limite de taille; reproduction.

INTRODUCTION

The Northwest Territories is known internationally for the trophy quality of many of its sport fisheries. This reputation is responsible for attracting a large number of tourists and anglers to the Northwest Territories each year. Sport fishing also constitutes an important form of recreation and has immeasurable aesthetic value for many residents of the Northwest Territories. It is therefore important that these fisheries be managed for the long-term benefit of the residents of Canada and the Northwest Territories.

While considerable attention has been directed to trophy lake trout, *Salvelinus namaycush* (Walbaum) (Falk et al. 1973, 1974a, 1975; Moshenko and Gillman 1978, In prep.) and Arctic char, *S. alpinus* (Linnaeus) (Peet and Dowler In prep.; Falk and Dahlke 1979), less emphasis has been placed on two other important sport fish species - Arctic grayling, *Thymallus arcticus* (Pallas), and northern pike, *Esox lucius* Linnaeus. In the Northwest Territories these two species are known for their trophy size and fighting ability, particularly in the Brabant Island-Beaver Lake area of the Mackenzie River (Bishop 1967; Gillman and Dahlke 1973; Falk and Gillman 1974). A survey of anglers who fished in the Northwest Territories during 1974 revealed that Arctic grayling and northern pike are highly prized and second only to lake trout as species sought (Topolniski 1975). The survey also determined that, to these anglers, size of fish was more important than numbers caught.

In 1974, the catch and possession limits for Arctic grayling were reduced from 10 and 10 to 5 and 10, respectively, and a minimum size limit of 356 mm (14 in) was introduced for grayling in the upper Mackenzie River from 116 to 118° west longitude. This management strategy was implemented following a recommendation of Falk and Gillman (1974) who demonstrated a decline in the abundance of trophy-size grayling in the area between 1965-66 and 1972-73. A recommendation was also made that a follow-up study should be undertaken to determine if the minimum size limit was successful in preventing a further decline in the numbers and size of grayling.

This report was prepared with the following objectives in mind: 1) to describe the sport fisheries for Arctic grayling and northern pike in the Brabant Island-Beaver Lake area of the Mackenzie River; 2) to describe the biology of Arctic grayling and northern pike in this area; 3) to assess the effectiveness of the 356 mm minimum size limit imposed in 1974 for grayling, and 4) to develop management strategies appropriate to the long-term viability of the trophy fishery for Arctic grayling and northern pike in the Brabant Island-Beaver Lake area.

STUDY AREA

The study area for this investigation encompasses the Mackenzie River from 116 to 118° west longitude which forms part of a special management area for Arctic grayling. Near the outlet of Great Slave Lake the Mackenzie River is divided by Big Island into two main channels (North and South) (Fig. 1). Downstream the river widens as these two channels converge to form Beaver Lake. In this report the Brabant Island area generally refers to the South Channel vicinity where Arctic grayling is the primary sport fish. Northern pike dominate the sport catch in the Beaver Lake area.

The Brabant Island and Beaver Lake areas have been described previously by Bishop (1967) and Renewable Resources Consulting Service (RRCSL) (1978). In the South Channel region there are numerous islands (Fig. 2), the larger of which (Brabant, Lobstick and Matheson) support heavy stands of black spruce, willow and alder predominate on the smaller islands. Water current and depth are variable throughout the study area; however, there is a dredged channel for navigation which begins at Brabant Island and extends down the Mackenzie River through Beaver Lake. In the vicinity of Brabant and Lobstick islands the water is deep (2-4 m) and swift-flowing. Aquatic vegetation is meagre and the substrate consists of medium to large size rocks and gravel bars. Inshore areas of the Brabant Island area and Beaver Lake exhibit less current and possess silt or clay substrates and heavy aquatic vegetative growth.

THE FISHERY

Angling pressure in the Brabant Island-Beaver Lake area is exerted by guests of a sport fishing lodge located on Brabant Island (Brabant Island Lodge) and by itinerant anglers. Both groups utilize the entire area for sport fishing but itinerant anglers tend to concentrate in the Beaver Lake area.

Brabant Island Lodge is located on the southwest corner of Brabant Island (Fig. 2). The operation started in the mid-1960's as a tent camp and progressed to a fully modern lodge with a capacity of 40 guest-beds. Guests normally stay for a one-week period; however, due to the close proximity to Hay River the length of stay may be shortened to 2 or 3 days. The fishing season starts immediately after ice break-up, usually during the third week of June, and continues until early September. A variety of fish species are caught including Arctic grayling, northern pike, walleye, *Stizostedion vitreum* (Mitchill), inconnu, *Stenodus leucichthys* (Güldenstadt), and lake cisco, *Coregonus artedii* Lesueur. Most angler-effort, however, is directed at Arctic grayling and northern pike. Grayling are angled using fly or spinning tackle in the faster and clearer water areas adjacent Brabant, Lobstick, Naylor and Matheson islands. Pike are abundant throughout the shallow inshore areas of the study area but are concentrated in portions of Beaver Lake. Spinning gear with spoons are used almost exclusively for this species. Both grayling and pike are retained as trophies for mounting or as food. The lodge management is active in encouraging anglers to release fish under trophy size.

A substantial number of anglers boat upstream from Fort Providence and Dory Point (Fig. 1) to fish in the Beaver Lake area. Their trips are usually 1 to 3 days in length. These itinerant anglers tend to concentrate on "limit" fishing and take home most fish in fillet form. It was not possible to determine the harvest of game fish by itinerant anglers in 1978.

MATERIALS AND METHODS

During June and July, 1978 a creel census and biological sampling program was carried out at Brabant Island Lodge (Fig. 2). Results from this investigation plus those from Bishop (1967), Gillman and Dahlke (1973), unpublished data, and RRCLS (1978) constitute the data base for this study. Data from 1965 to 1978 are presented in tabular form in an Appendix.

CREEL CENSUS

The 1978 creel census was conducted utilizing techniques and forms adapted from Falk et al. (1974a). At the end of each day as many anglers as possible were interviewed and questioned about the numbers of fish of each species caught, released, retained and eaten, as well as about the hours and locations fished and the anglers place of residence. Census workers also recorded the number of anglers observed but not interviewed. Normally, anglers were interviewed upon their return to the lodge (from 1600 to 1800 h) but creel census operations were extended to the evening hours when fishing pressure warranted. A portion of the angler's catch was sampled for later biological analysis.

BIOLOGICAL SAMPLING

Arctic grayling and northern pike caught by angling were sampled for fork length (±1 mm) and round weight (±25 g). Scales were removed from areas as described by Hatfield et al. (1972). Sex and stage of maturity were determined by examination of the gonads and coded according to the following maturity scale adapted from Falk and Gillman (1974):

Sex		Maturity	Description of Gonads
Male	Female		
1	6	Immature	Virgin fish; gonads thin and threadlike, often incomplete.
2	7	Maturing	Virgin or non-virgin fish not spawning in the current year; gonads full length, firm; eggs small; gonads partially fill body cavity.
3	8	Mature	Fish spawning in current year; gonads full size, filling body cavity; eggs prominent, full size.
4	9	Ripe	Mature fish in spawning condition; eggs translucent; milt or eggs expelled under slight pressure.
5	10	Spent	Mature fish, completed spawning condition; gonads collapsed with ruptured blood vessels prominent; residual eggs.
0		Unknown	-

AGING AND DATA ANALYSIS

Scales collected from Arctic grayling and northern pike were cleaned and placed between two glass slides. Annuli were counted on the magnified image (x 45) produced by an Eberbach microprojector. Ages were assigned to correspond to the number of completed annuli. With the exception of older individuals (age 9+) no major difficulties were encountered in determining ages for grayling by scales. In contrast, considerable difficulty was encountered with most pike scales. As a result all northern pike scales were read several times by the same person before a final scale age was assigned.

Data collected during the study were manipulated using an IBM computer based at the University of Manitoba and a terminal located at the Freshwater Institute. The Statistical Analysis System (1972) was used to generate length, weight, age, sex and maturity summaries and perform basic calculations and statistical analyses. Calculations of the creel harvest and estimated total harvest and other statistical analyses were performed using a Hewlett-Packard (Model 9810-A) programmable calculator.

Length-weight relationships were described by the following power equation:

$$\text{Log}_{10}W = a + b\,(\text{Log}_{10}L);\ S_b =$$

where: W = weight in grams
L = fork length in millimetres
a = Y-intercept
b = slope of the regression line, and
S_b = standard deviation of b

Relative condition factors (K) were determined from the formula:

$$K = \frac{W \times 10^5}{L^3}$$

Statistical analyses (Chi^2, analysis of covariance, Student's t-test) were performed following the procedures outlined by Snedecor and Cochran (1968). Annual survival/mortality rates were determined using the methods described by Robson and Chapman (1961).

RESULTS

CREEL CENSUS

During 1978, 32 days were censused and 434 anglers were interviewed (Table 1). Angler success in 1978 averaged 1.9 Arctic grayling and 2.9 northern pike per angler-hour. These catch rates were similar to those determined from previous years (1972-73) (Table 2). In 1978, the total numbers of Arctic grayling and northern pike taken were estimated to be 1419 (1195 kg) and 2126 (8876 kg), respectively. The total harvest of both species was higher in 1978 than in 1972 (AG=1092; NP=551) and 1973 (AG=684; NP=820) while the harvest per angler for 1978 approximated previous levels.

BIOLOGICAL INVESTIGATION - ARCTIC GRAYLING

Size composition

The mean length of Arctic grayling for the overall angled catch was 399 mm (N = 1397; SD = 61.3); males had a greater mean length than females:

	N	Mean Length (mm)	Modal Length Group (mm)	SD
Male	835	412	440-449	56.2
Female	405	386	410-419	62.2

Mean lengths for angled Arctic grayling (sexes combined) ranged from 370 mm (N = 238; SD = 75.7) in 1966 to 424 mm (N = 167; SD = 26.1) in 1978.

Length-frequency distributions illustrated in Fig. 3 reveal a decrease in size among angled grayling (>356 mm) from 1965-66 to 1972-73 as reported by Falk and Gillman (1974). It should be noted that in 1965-66 and 1977 almost all angled fish were sampled while in 1972-73 and 1978 only the retained portion of angler-caught fish were sampled. Further, in 1966 effort was directed to searching for areas frequented by smaller grayling. This explains the smaller size of angled grayling in 1977 as compared to 1978 but further emphasizes the decline in their size. The length distribution of grayling from 1978 is biased towards larger fish due to the 356 mm minimum size limit regulation. However, because it is skewed to the right (Fig. 3) it demonstrates the relative abundance of larger fish that are still available to the trophy fishery.

Length-weight relationship

Length-weight relationships for angled Arctic grayling from the Brabant Island area are presented by year and by sex in Table 4. Equations for the pooled sample (1965-78) are expressed by sex and combined as follows:

Male $\log_{10}W = -4.5342 + 2.851\ (\log_{10}L)$; N = 835; $S_b = 0.024$

Female $\log_{10}W = -4.5750 + 2.868\ (\log_{10}L)$; N = 405; $S_b = 0.031$

Combined $\log_{10}W = -4.5643 + 2.863\ (\log_{10}L)$; N = 1397; $S_b = 0.017$

Analysis of covariance revealed no significant difference ($P>0.05$) between slopes ($F = 0.20$; df = 1,1236) and adjusted means ($F = 1.33$; df = 1,1237). However, the slope of the length-weight relationship for 1978 (3.771) is shown in Table 11 to be substantially higher than those determined from previous years. This was a result of mature and ripe grayling comprising a greater percentage of the retained catch because the 1978 creel census was conducted earlier than in previous years. The difference in slope between mature and ripe fish (b = 3.867) and spent fish (b = 2.687) was found to be significantly different at $P = 0.01$ ($F = 8.3$; 1,166 df). The difference between adjusted means was also significant ($F = 27.7$; 1,167 df; $P<0.01$).

Condition factors (K) for Arctic grayling were 1.20 for males, 1.22 for females and 1.21 for the combined sample (1965-78).

Age composition

The mean age of Arctic grayling for the overall angled catch was 6.4 yr (N = 1347; range 1-12); males had a greater mean age than females:

	N	Mean Age (yr)	Modal Age Group	Range (yr)
Male	809	6.8	8	1 - 12
Female	382	6.0	6	1 - 12

Mean ages for angled Arctic grayling (sexes combined) ranged from a high of 6.9 yr (N = 428; range = 1-12) in 1965 to a low of 5.8 yr (N = 238; range = 1-12) in 1966. Age-frequency distributions are illustrated by year in Fig. 4. As shown by Falk and Gillman (1974) the age of larger grayling (>356 mm) decreased between 1965-66 and 1972-73. The modal age group of age 6 continued to dominate the angled catch in 1977. However, in 1978 the modal age group was age 7. This is considered to be more a function of the minimum size limit than age-class strength since only legal-size fish were retained by anglers.

Growth

Comparison of smoothed curves of length and weight against age of Arctic grayling revealed no apparent variation or trend between years. Growth in length and weight illustrated in Fig. 5 for combined data (1965-78) indicate that male grayling grow at a faster rate and tend to live longer than females. The growth rates appeared to diverge substantially after age 2. This difference was compared by analysis of covariance from the following semi-logarithmic relationships:

Males: $\log_{10}Len = 2.398 + 0.031\ (Age)$; N = 809; $S_b = 0.001$

$\log_{10}Wt = 2.288 + 0.091\ (Age)$; N = 809; $S_b = 0.002$

Females: $\log_{10}Len = 2.334 + 0.043\ (Age)$; N = 382; $S_b = 0.001$

$\log_{10}Wt = 2.105 + 0.118\ (Age)$; N = 382; $S_b = 0.003$

The difference in slope ($F = 48.4$; df = 1,1187) and adjusted means ($F = 48.4$; df = 1,1188) between the length-age relationships were highly significant ($P<0.01$). For the weight-age relationship the difference in slope was significant at $P = 0.01$ ($F = 48.0$; df = 1,1187) while that for adjusted means was significant at $P = 0.05$ ($F = 4.2$; df = 1,1188). Similar differences in growth rate between sexes have been reported by Ward (1951), Kruse (1959), Bishop (1967), Tripp and McCart (1974), Machniak and Bond (1979), and others. The growth curve (length vs. age) for Arctic grayling (sexes combined) is compared to those given for other populations in North America in Fig. 6.

Mortality

Catch curve analysis for Arctic grayling caught by angling from the Brabant Island area indicated that the annual mortality rates (total) ranged from a high of 67 percent in 1972 to a low of 48 percent in 1977 (Table 5, Fig. 7). The pooled (1965-78) sample revealed annual mortality

rates of 43 percent (sexes combined), and 62 and 50 percent, respectively for males and females.

Sex ratio and maturity

The F/M ratio for Arctic grayling tended to decrease with increasing size and age. Males outnumbered females in the angled catch each year with F:M ratios fluctuating from a low of 0.4:1 in 1966 to a high of 0.7:1 in 1977. The F/M ratio of 0.5:1 for the combined angled catch of grayling (1972-78) was significantly different from unity ($\chi^2 = 149.1$; $P<0.05$).

Sexual maturity was first reached at age 3 for both sexes. Most females appeared to mature earlier and at a smaller size than males. From probability paper it was determined that the size at 50 percent maturity was 350 mm for males and 300 mm for females.

BIOLOGICAL INVESTIGATION - NORTHERN PIKE

Size composition

The mean length of northern pike for the overall angled catch was 771 mm (N = 555; SD = 159.5); females had a greater mean length than males:

	N	Mean Length (mm)	Modal Length Group (mm)	SD
Male	135	770	720-739	99.1
Female	254	815	800-819	170.5

Mean lengths for angled northern pike (sexes combined) ranged from a high of 850 mm (N = 130; SD = 109.5) in 1978 to a low of 673 mm (N = 229; SD = 151.6) in 1977. Length-frequency distributions illustrated in Fig. 8 reveal that the retained catch of northern pike has remained relatively similar from 1972-73 to the present (1978) but there is a marked absence of pike larger than 1100 mm in the 1977-78 catches. The 1977 sample is not directly comparable to those of 1972-73 and 1978 since almost all angled fish were sampled but it seems to illustrate the abundance of smaller fish which will become "keepers" within the next several years.

Length-weight relationship

Length-weight relationships for angled northern pike from the Beaver Lake area are presented by year in Table 6. Equations for the pooled sample (1972-78) are expressed by sex and combined as follows:

Male $\quad \log_{10}W = -4.8983 + 2.904\ (\log_{10}L)$; $N = 135$; $S_b = 0.086$

Female $\quad \log_{10}W = -4.9787 + 2.296\ (\log_{10}L)$; $N = 254$; $S_b = 0.034$

Combined $\quad \log_{10}W = -4.9803 + 2.933\ (\log_{10}L)$; $N = 555$; $S_b = 0.024$

Analysis of covariance revealed no significant difference ($P>0.05$) between slopes ($F = 0.06$; $df = 385$) or between adjusted means ($F = 1.19$; $df = 386$).

Age composition

The mean age of northern pike for the overall angled catch was 11.2 yr (N = 535; range = 5-19); females had a greater mean age than males:

	N	Mean Age (yr)	Modal Age Group	Range (yr)
Male	110	11.8	12	6 - 16
Female	216	12.4	13	5 - 19

Mean ages for angled northern pike (sexes combined) ranged from a high of 13.3 yr (N = 79) in 1972 to a low of 10.4 yr (N = 343) in 1978. Age-frequency distributions illustrated by year in Fig. 9 reveal an apparent shift towards younger fish from 1972-73 to 1978.

Condition factors (K) for northern pike were 0.67 for males, 0.66 for females and 0.68 for the combined sample (1972-78).

Growth

Comparison of smooth curves of length and weight against age for northern pike revealed no apparent variation or trend among years. Growth in length and weight illustrated in Fig. 10 indicate that female pike grow at a faster rate and live longer than males. The divergence in growth rate was most apparent after age 8. This difference was compared by analysis of covariance from the following semi-logarithmic relationships:

Males: $\log_{10}Len = 2.881 + 0.019\ (Age)$; $N = 110$; $S_b = 0.001$

$\log_{10}Wt = 2.683 + 0.022\ (Age)$; $N = 110$; $S_b = 0.003$

Females: $\log_{10}Len = 2.653 + 0.067\ (Age)$; $N = 216$; $S_b = 0.001$

$\log_{10}Wt = 2.707 + 0.072\ (Age)$; $N = 216$; $S_b = 0.005$

The difference in slope ($F = 3.7$; $df = 1,322$) between the length-age relationships was not significant ($P>0.05$) while the difference in adjusted means ($F = 53.3$; $df = 1,323$) was significant at $P = 0.01$. Similarly, for the weight-age relationships the difference between slopes ($F = 0.8$; $df = 1,322$) was not significant ($P>0.05$) but the difference in adjusted means was significant at $P = 0.01$ level. Similar differences in growth rates for males and females have been reported for southern populations by Hassler (1969), Makowecki (1973), Machniak and Bond (1979) and others but not for northern populations (Miller and Kennedy 1948).

The growth curve (length vs. age) for northern pike (sexes combined) is compared to those given for other North American populations in Fig. 11.

Mortality

Catch curve analysis for northern pike caught by angling from the Beaver Lake area indicated that the annual mortality rates (total) ranged from a high of 44 percent in 1973 to a low of 32 percent in 1972 and 1978 (Table 7; Fig. 12). The pooled (1972-78) sample revealed annual mortality rates

of 40 and 37 percent, respectively for males and females.

Sex ratio and maturity

The F/M ratio for northern pike appeared to increase with increasing size and age. Females outnumbered males in the angled catch each year with F:M ratios fluctuating from a low of 1.1:1 in 1977 to a high of 2.4:1 in 1978. The F:M ratio of 1.9:1 for the combined angled catch of pike (1972-78) was significantly different from unity (χ^2 = 36.4; P<0.05).

While there are insufficient data on smaller/younger pike it is apparent that first sexual maturity is reached by age 7 and complete sexual maturity by age 9 for both sexes.

DISCUSSION

Arctic grayling and northern pike as well as lake trout and Arctic char from the Northwest Territories are recognized internationally as trophy fish because of their large size and are responsible for attracting a large number of tourists from southern Canada and the United States. The sport fishery for grayling and pike in the Brabant Island - Beaver Lake area of the Mackenzie River is unique in that it is of trophy quality despite being located close to the major population centers of Yellowknife and Hay River. Grayling and pike are both highly regarded by resident and non-resident anglers although ranking behind lake trout in order of preference (Topolniski 1975). Arctic grayling are known for their fighting ability, especially on light spinning and fly-fishing tackle, distinctive colouration, large dorsal fin (males) and overall size in the Brabant Island area while northern pike are known for their size and fighting nature in the Beaver Lake area.

A true "trophy" sport fishery must satisfy certain criteria. These are: a relative abundance of large (trophy size) fish; a low rate of exploitation; restricted access (by road); and the absence of commercial fishing. The Brabant Island and Beaver Lake areas meet these criteria at present. Results of the present study indicate that there is an adequate supply of large fish to satisfy present demands on the fish resources. Access is currently limited, being gained by water routes along the Mackenzie River or by float plane. Finally, commercial fishing is not permitted in the Brabant Island - Beaver Lake area. The major threat to the trophy fishery for Arctic grayling and northern pike in this area is considered to be from overexploitation resulting from increased access caused by: an expanding human population in the immediate area; increasing number of tourists to the upper Mackenzie River valley, and construction of a road along the south shore of Great Slave Lake from Hay River to the Mackenzie Highway. Increasing angling pressure through unrestricted access will lead inevitably to greater overall catches and without effective management controls this will lead to further decline of the grayling and pike trophy fishery in the Brabant Island - Beaver Lake area.

While reasons for the large size of Arctic grayling and northern pike in the Brabant Island - Beaver Lake area are always difficult to assess it is apparent that environmental conditions and the habitat afforded by the Mackenzie River in the study area are conducive to good growth. Growth of northern pike, while generally slower than in the south, is faster than that reported elsewhere in the Northwest Territories; growth of Arctic grayling is among the fastest reported for North America. Similarly, the sizes attained by these species in this area rank among the largest recorded above 60° north latitude. Bishop (1967) considered the conditions in the Brabant Island area to be nearly ideal for Arctic grayling.

The size of Arctic grayling caught by angling in the Brabant Island area has shown a marked decline from 1965-66 to 1972-73 (Falk and Gillman 1974) but subsequently appears to have remained stable. The reason for this is not clear but it is believed to be a combination of continued restriction of access, conservative lodge practices, adoption of a 356 mm minimum size limit and reduction of catch and possession limits from 10 and 10 to 5 and 10, respectively, in 1974. Likewise, the size of angled northern pike from the Beaver Lake area is reported to have declined after the 1950's (Fishery Officers, Pers. Comm.) but there are no biological data to support this. Results from the present study as well as those presented by RRCSL (1978) indicate the absence of large pike (>1100 mm) from 1977-78 catches compared to those from 1972-73. Again, without effective management controls a further decline of the trophy fishery for grayling and pike in the Brabant Island - Beaver Lake area is inevitable.

Within the management area defined from 116 to 118° west longitude including the Mackenzie River and tributary streams along this reach there are a number of management strategies that might be applied for the maintenance of a trophy fishery for Arctic grayling and northern pike. Typical fishery management strategies which could be applied to this area include: restrictions on areas and/or seasons fished; reduced catch and possession limits; setting overall catch quotas; establishment of minimum/maximum size limits, and a combination of these. The objective of the management strategy adopted should ensure a continuing supply of large fish as well as an adequate supply of pre-recruits to the trophy category while not reducing fishing quality (catch per unit of effort) below acceptable levels.

Closed areas or seasons have been practised successfully in North America to protect spawning fish, to reduce catch rate, to distribute harvest through time and to reduce conflicts between fisheries (Christie 1978). While the intent of area or season closures may appear sound, this management practice has several drawbacks. Technically, the time of year a fish is caught has little to do with the perpetuation of the fish stock since the capture of a female fish represents the same loss to the spawning population whether it occurs immediately before spawning or at another time. Season limits cannot ensure that a female will complete spawning at any one particular age or size. Fishing seasons seldom limit harvest in any significant way as angling pressure tends to be redistributed to other times of the year. Also, there exists the possibility that fish stocks may be over-protected by limiting catches to times of the year when the fish are not

vulnerable to angling (Eschemeyer and Manges 1945; Churchill 1957; Eschemeyer 1946; Christensen 1953). Restrictions on fishing areas have much the same results as restrictions on fishing seasons. They can, however, completely protect some stocks from exploitation where fish are only vulnerable to fishing in the closed area.

Catch and possession limits constitute a common means of restricting the efficiency of individual fishermen (Roundsefell and Everhart 1953). The use of these limits, also called bag or creel limits, have been advocated for a variety of reasons including to: 1) reduce the catch so that more fish survive to spawn or to be caught at larger sizes; 2) distribute the catch more evenly to fishermen; 3) provide a goal for the angler to aim at, and 4) prevent fish-hoarding and waste and encourage fishing for sport rather than meat for the table. Such limits are not always successful or beneficial to the population. In many warmwater and some coldwater fisheries, stunted populations showed increased growth and were harvested more effectively when catch limits were removed (Eschemeyer 1946). In other cases these limits were shown to be unnecessary when angling pressure was light (Piedmore 1948; Pelton 1948; Klingbiel 1953) and may lead to stockpiling (Shetter and Alexander 1965, 1966). Furthermore, Hunt et al. (1962) and Shetter (1968) found no difference in harvest before and after reduced bag limits were imposed. McFadden (1969) suggested that reduced limits may lead to a lower overall harvest through its psychological influence. It is important to note that catch and possession limits are not effective in restricting harvest when there are no controls on the number of anglers and provide no protection until the limit is reached (Hunt 1970). If these limits are to be successful they must be set low enough to reduce the overall catch to a specified level. It is apparent from this analysis that the success of catch and possession limit restrictions is dependent upon the circumstances under which they are imposed and their intended purpose.

Setting quotas is an effective means to restrict total catch without limiting either the efficiency of the fishermen of the number of fishermen (Ricker 1958). This method is suitable only for species about which enough biological knowledge has been accumulated. The quota system has been used almost entirely in commercial fisheries but is directly applicable to sport fisheries where information on stock size and production potential is available.

Size limits are widely used in fishery management as conservation measures. In North America, minimum size or weight limits have been generally set to coincide with the size or age of first sexual maturity but have certain limitations (Christie 1978). The minimum size limit can be useful in recreational fisheries as a means of satisfying a diverse angling public. It is difficult, however, to gain sufficient control over effort in a public, open access fishery, to be able to deliberately manipulate the stocks to produce fish of a particular size. Whenever a l w level of control prevails a minimum size limit may be appropriate. Major objectives for establishing size limits include: 1) maximization of yield or weight harvested (Ricker 1945); 2) increase in catch of large fish (Anderson 1974), and 3) protection of future spawners. The predicted success of a minimum size limit presumes that growth and natural mortality rates remain unchanged (Hackney 1974). Also, knowledge of the population structure and rates of recruitment, mortality and growth is necessary before a size limit can be assigned intelligently (Sernes 1978). Sernes proposed that a size limit may increase sport fishing yield where there is a combination of one or more of the following factors: 1) limited natural reproduction; 2) good growth; 3) low natural mortality, and 4) high exploitation. Despite the popularity of size limits, this management practice has not always been successful in maintaining or enhancing fishing quality. For example, Kempinger and Carling (1978) found that for as long as a 560 mm length limit for northern pike was in effect the density of undersized pike doubled, total biomass increased by 43 percent, growth rate decreased, total mortality rate rose from 60 to 82 percent, and annual harvest and angler-success decreased.

After discussions with concerned parties and review of the above management strategies (and referral to others) it is concluded that no one alternative is applicable to both Arctic grayling and northern pike in the Brabant Island - Beaver Lake area; taking these aspects into consideration the following rationale for management practices appropriate to these species in this area has been developed.

It is apparent that the minimum size limit on Arctic grayling in the Brabant Island area has been effective in maintaining the trophy nature of the sport fishery, as the modal length (410-419 mm) of the retained catch has remained relatively unchanged although the modal age has increased from 6 to 7 yr. Modal age is now well above that of first sexual maturity for both sexes. Angler-success, in terms of numbers of grayling caught per angler and per angler-hour has not changed appreciably. It is apparent from this analysis that the minimum size limit has been successful in maintaining the trophy nature of the sport fishery. However, there are insufficient data on the Arctic grayling population to firmly support this conclusion. While a continued supply of large fish appears to be assured, increasing angling pressure will inevitably lead to a decline in the trophy quality of this sport fishery. Regulation of the number of grayling taken from the Brabant Island area through an overall quota or individual catch quotas emerge as viable management possibilities to limit the harvest and to distribute the catch among as many anglers as possible. The quota approach is attractive but insufficient data on the Arctic grayling population and uncontrolled access preclude this method from further consideration. Reduced catch and possession limits in combination with the minimum size limit constitutes the only viable and enforceable alternative.

From catch statistics it is clear that numbers of northern pike in the Beaver Lake area are relatively high but pike do not attain sizes comparable to those reported a decade ago. Increasing angling pressure will, in time, result in a further decline in size and possibly numbers unless appropriate management practices are adopted. A reduction of individual catch and possession limits is necessary to control the harvest of pike and distribute the catch among as many fishermen as possible. In view of the limited success of

minimum size limits for northern pike elsewhere in North America as discussed above, implementation of this method in the Beaver Lake area is not viewed as sound management. An alternative method of ensuring the long-term viability of a trophy fishery for pike is to require that only one of the retained catch (designated as a trophy fish) is to be above a given size. This is considered to be a more viable alternative in that it is intended to distribute trophy-size pike among a greater number of fishermen while reducing the possibility of ending up with a large number of small fish.

A major disadvantage of size limits, whether maximum or minimum, is that many fish must be returned to the water. While release of angled fish is a normal practice in most sport fisheries the requirement to return fish of any size draws much public attention. Release mortality for Arctic grayling and northern pike from Great Slave Lake has been determined to be 10.1 and 6.4 respectively for these species (Falk and Gillman 1975). Further, Beukema (1970) has shown that pike tend to avoid lures after being caught and released. Barbless hooks have been considered as a restriction applicable to a high release fishery but the data available are inconclusive as to whether their use is effective in reducing release mortality (Falk et al 1974b; Falk and Gillman 1975). However, with the use of barbless hooks, combined with proper handling and release methods, the return of an increased number of northern pike and Arctic grayling should not pose a significant threat to these species in the Beaver Lake - Brabant Island area.

RECOMMENDATIONS

1. Daily catch and total possession limits be reduced to 3 and 5, respectively for both Arctic grayling and northern pike in the special management area of the Mackenzie River from 116 to 118° west longitude, including tributary streams along this reach.

2. The 356 mm (14 in) minimum size limit for Arctic grayling in the special management area is to remain in effect.

3. A maximum size limit be imposed on northern pike in the special management area to the effect that only one of the retained catch is to be greater than 890 mm (35 in).

4. There should be a requirement that barbless hooks be used in waterbodies designated as trophy fisheries in the Northwest Territories.

5. A follow-up study should be carried out within three years to determine the effectiveness of the reduced catch and possession limits and size limit restrictions.

6. A tagging program on Arctic grayling and northern pike should be initiated to assess their movements and distribution within this area.

ACKNOWLEDGMENTS

R. W. Moshenko is acknowledged for designing and supervising the project in 1978. The authors thank the management and staff of Brabant Island Lodge for their continued support and cooperation. Conservative measures adopted by the lodge are in part responsible for preserving the trophy status of the sport fishery in the area. Field work was conducted by D. Leroux, H. Jobbins and R. Mulders and logistic support was provided by G. Low, Fishery Management Technician, and Fishery Officers from Hay River. Renewable Resources Consulting Services Ltd., Edmonton, is acknowledged for the provision of raw data from their 1977 study in the Brabant Island - Beaver Lake area. Ages of Arctic grayling and northern pike were determined by C. Read. Graphic Services, Freshwater Institute, is credited with drafting the figures. L.J. Johnson and W. A. Bond provided criticism and suggestions on the manuscript.

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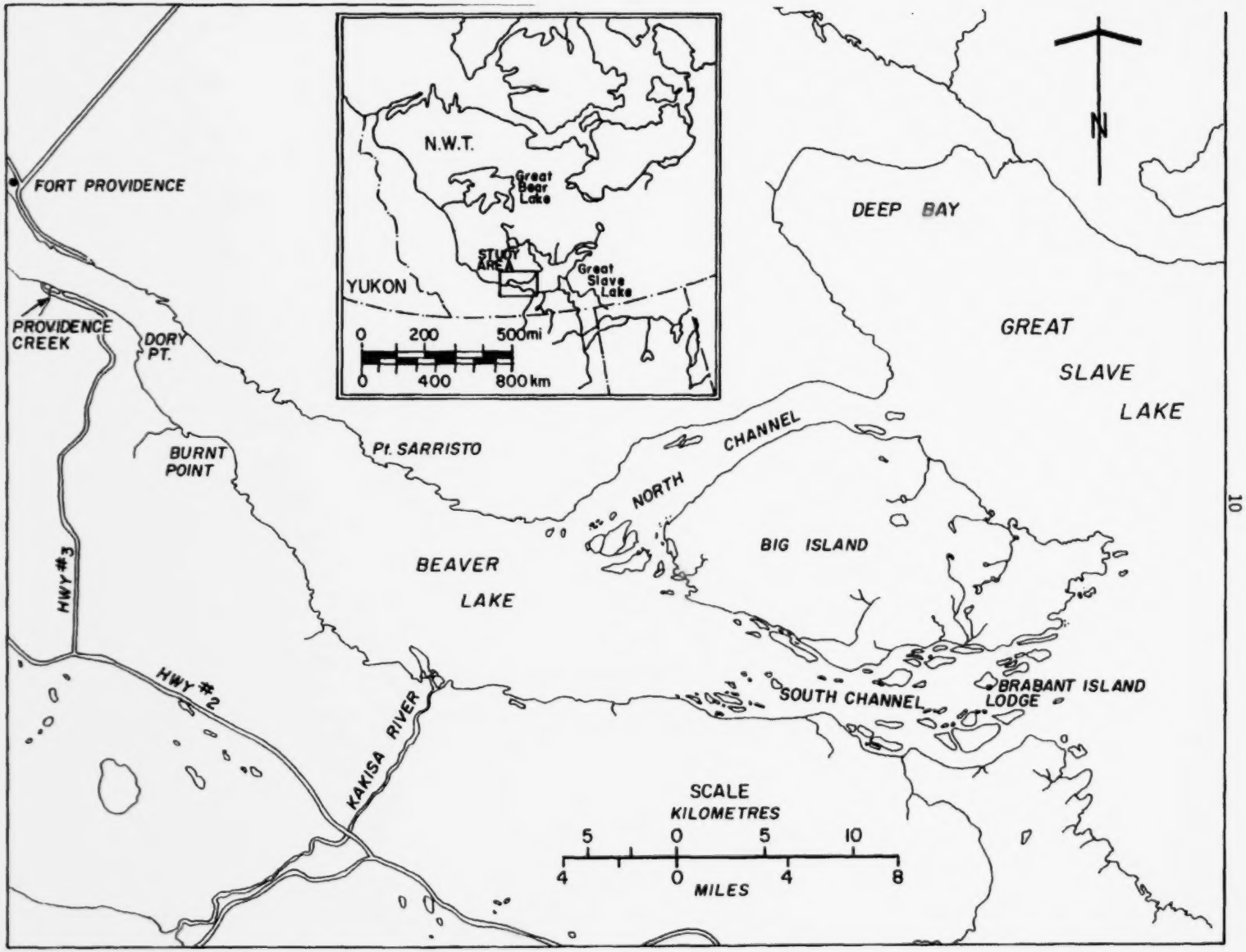

Fig. 1. Map of the upper Mackenzie River showing the Brabant Island and Beaver Lake areas.

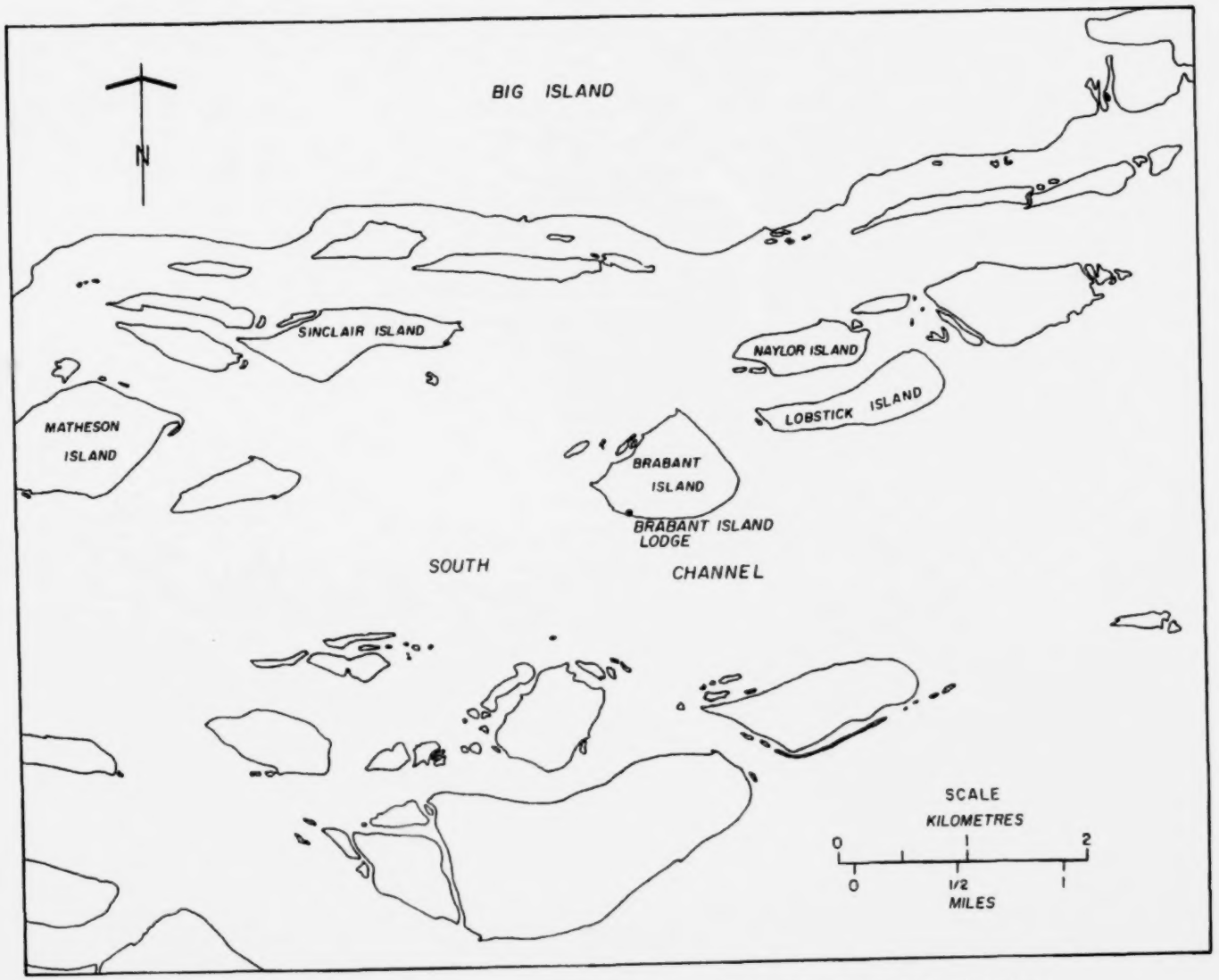

Fig. 2. Map of the Brabant Island area showing the location of Brabant Island Lodge.

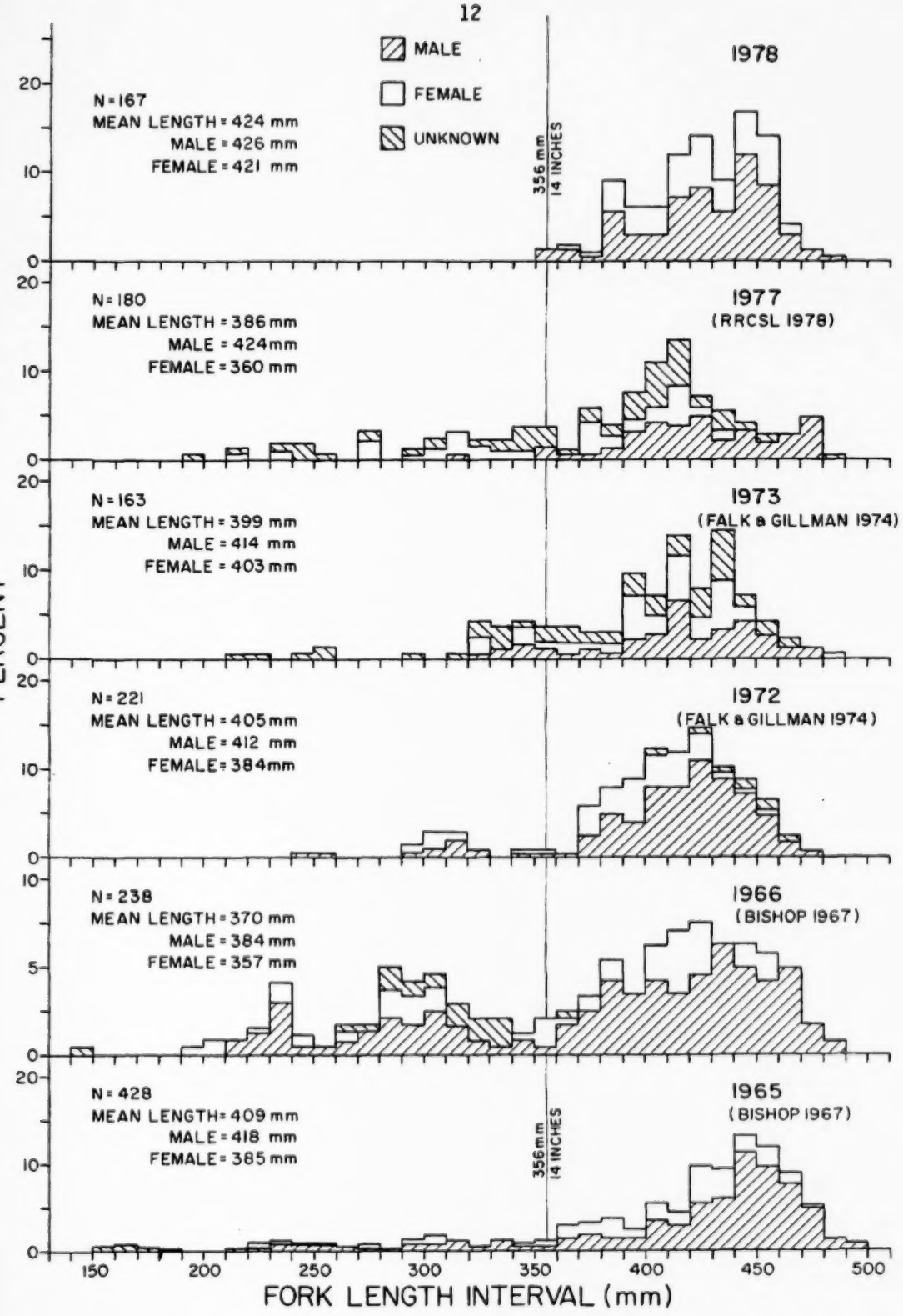

Fig. 3. Length-frequency distributions for Arctic grayling caught by angling from the Brabant Island area, 1965-78.

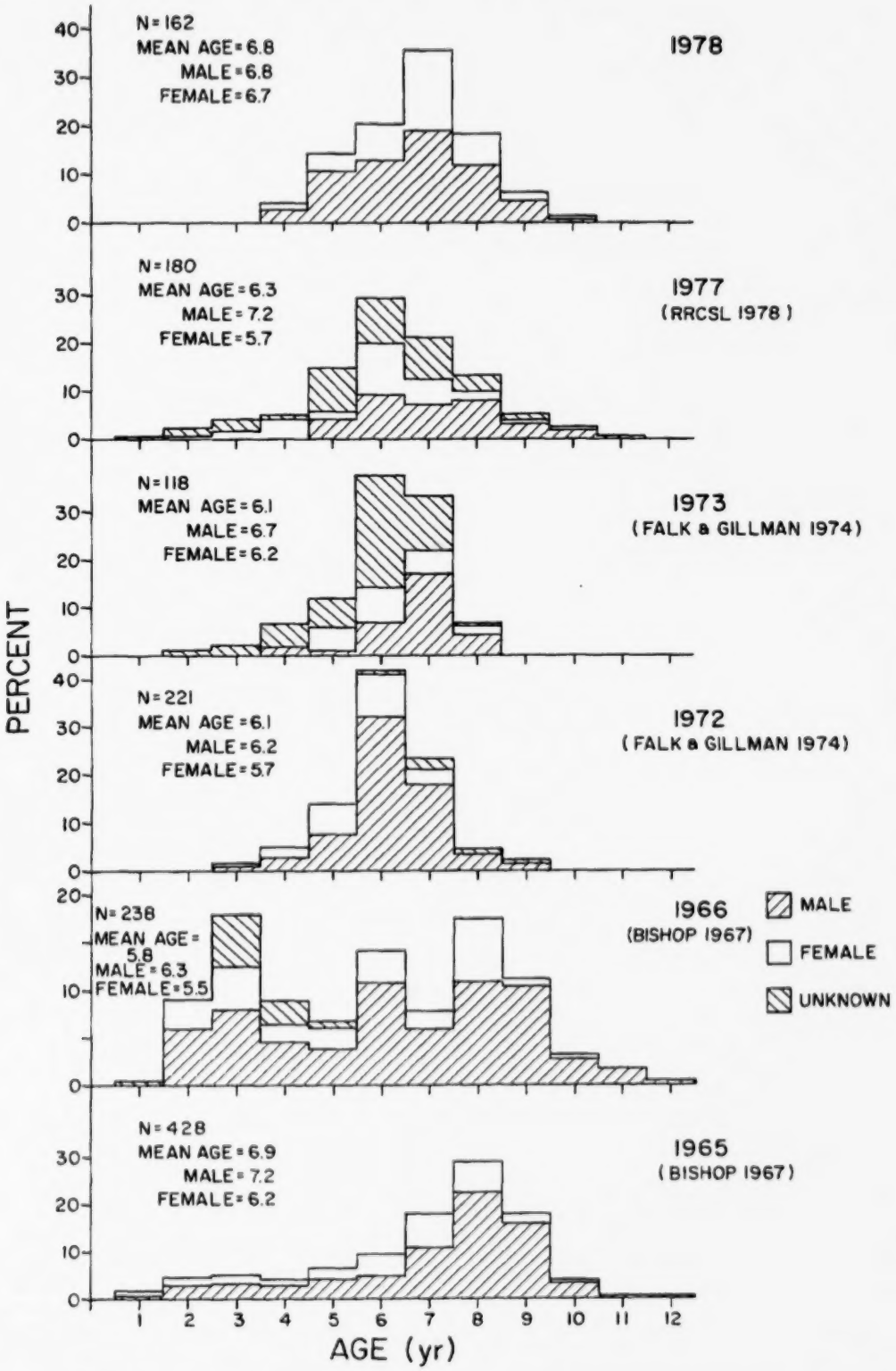

Fig. 4. Age-frequency distributions for Arctic grayling caught by angling from the Brabant Island area, 1965-78.

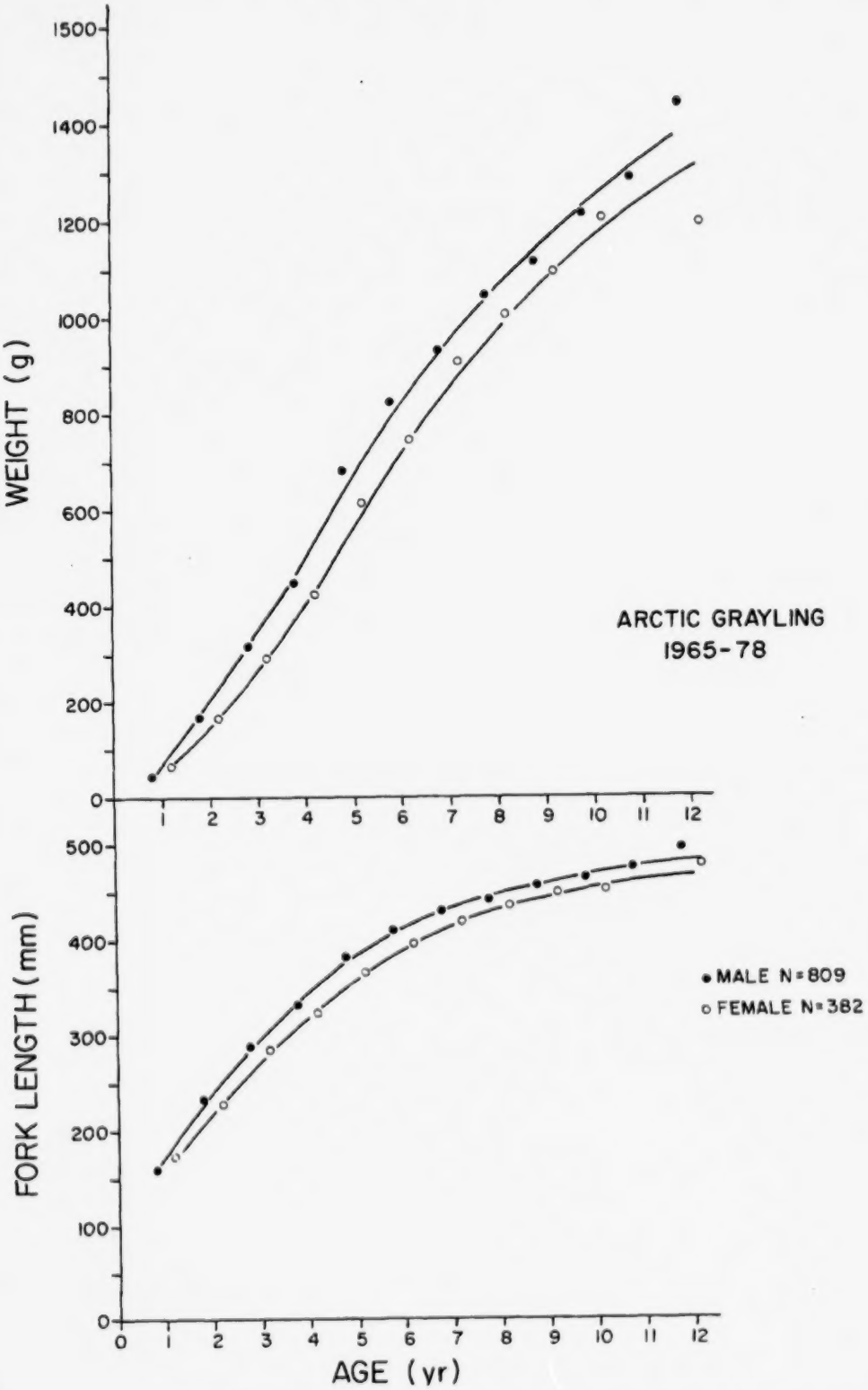

Fig. 5. Average growth rates for male and female Arctic grayling caught by angling from the Brabant Island area, 1965-78.

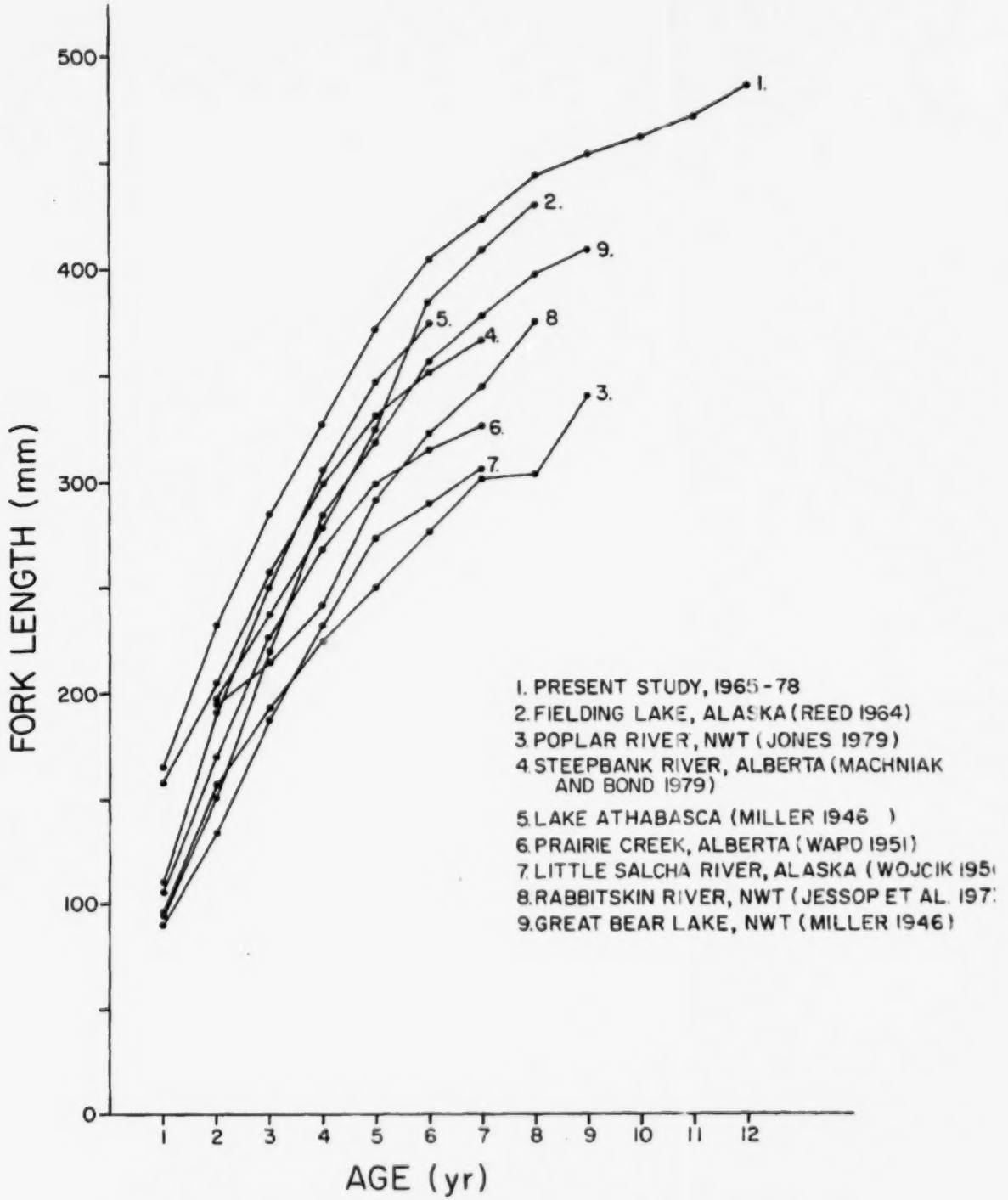

Fig. 6. Comparison of average growth rates for Arctic grayling from the Brabant Island area to other populations in North America.

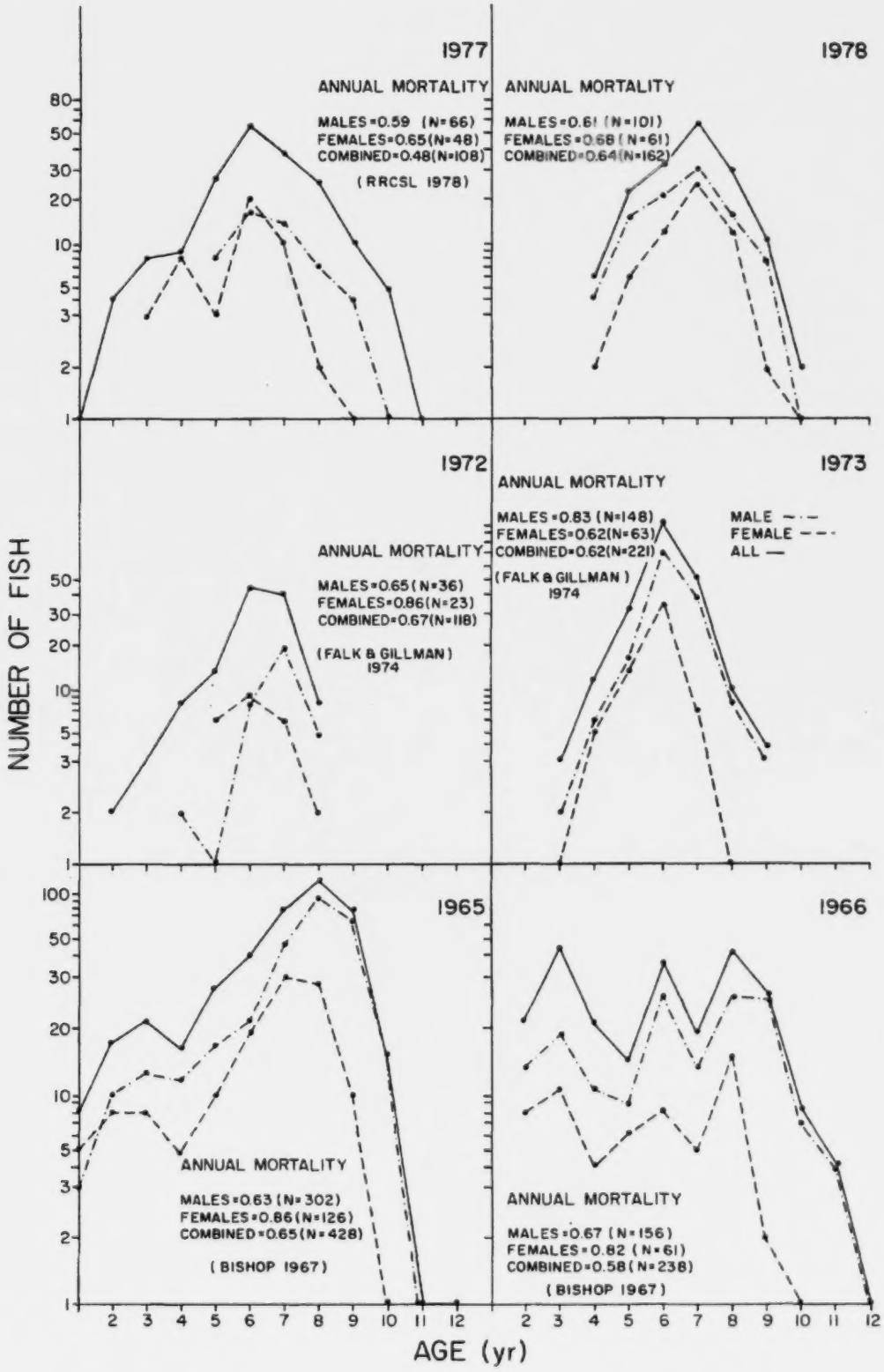

Fig. 7. Catch curves for angled Arctic grayling from the Brabant Island area, 1965-78.

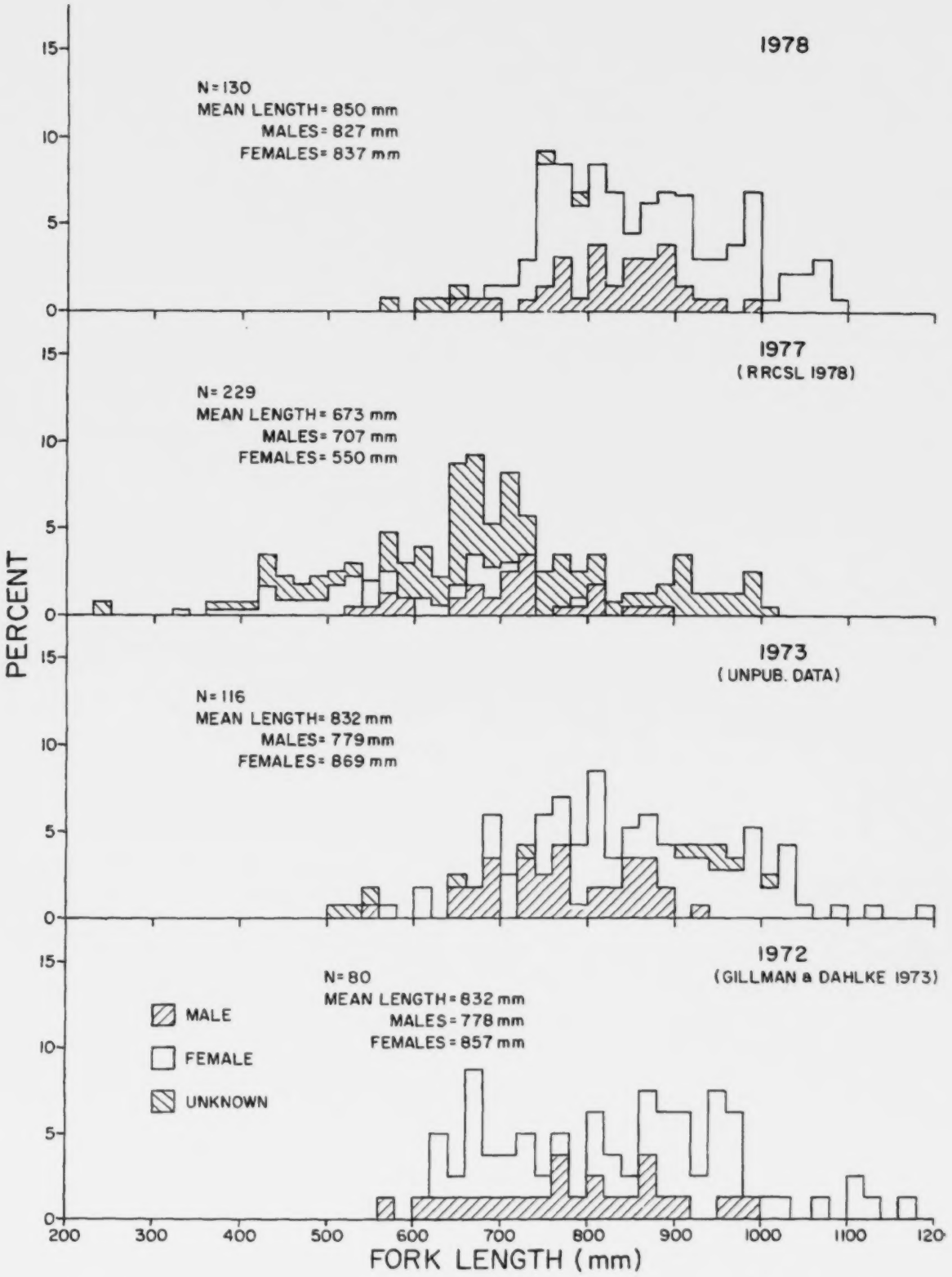

Fig. 8. Length-frequency distributions for northern pike caught by angling from the Beaver Lake area, 1972-78.

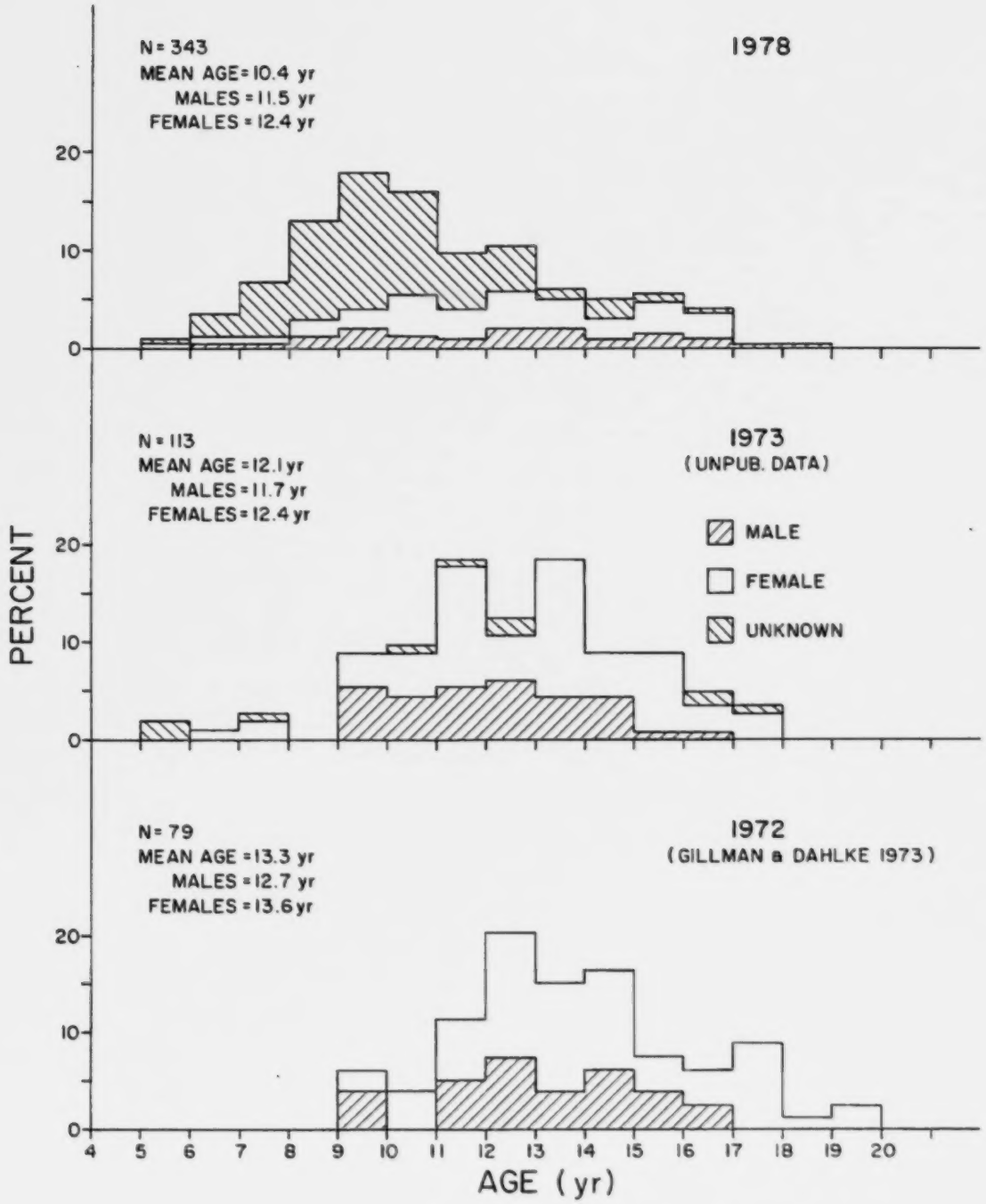

Fig. 9. Age-frequency distributions for northern pike caught by angling from the Beaver Lake area, 1972-78.

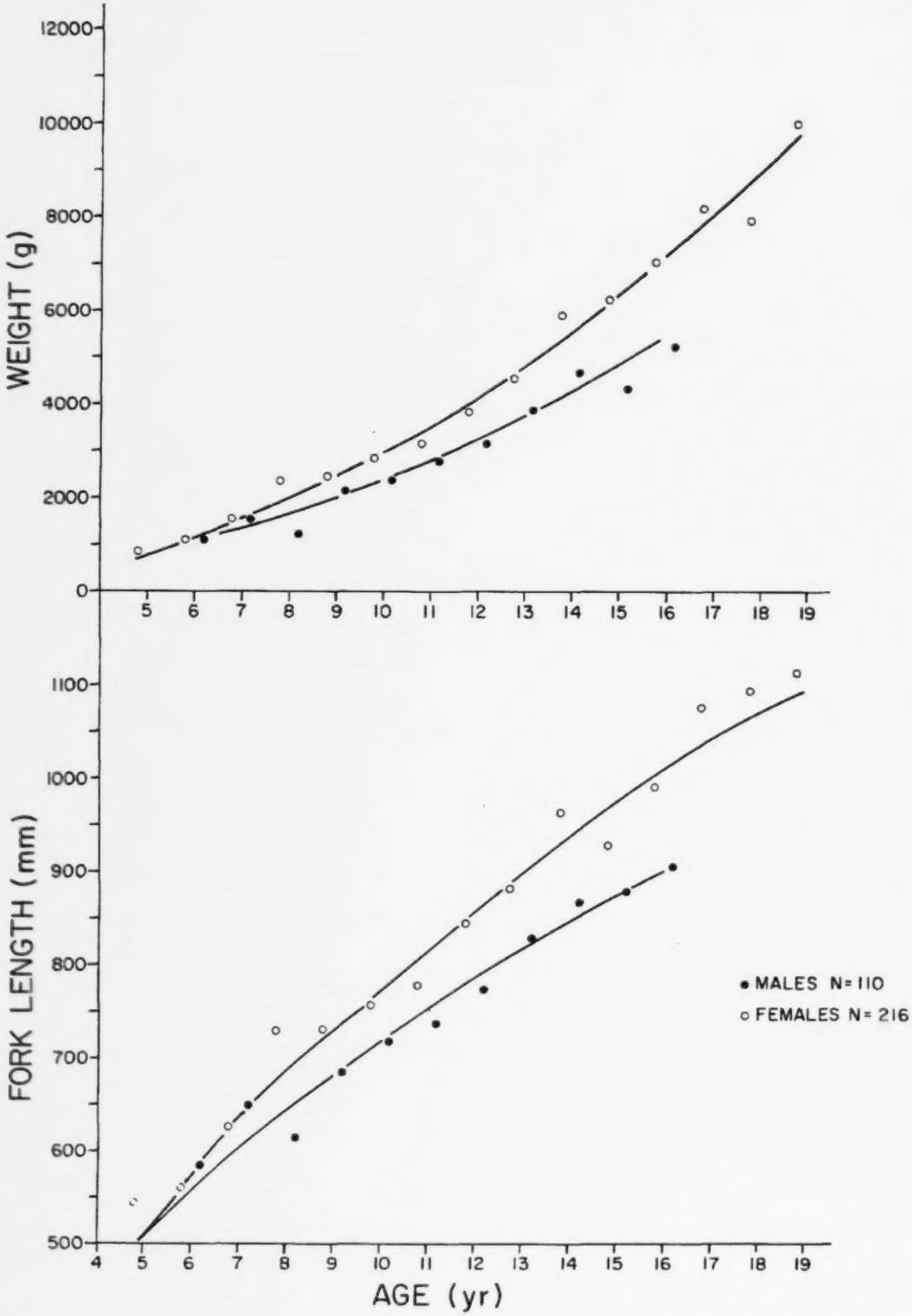

Fig. 10. Average growth rates for male and female northern pike from the Beaver Lake area, 1972-78.

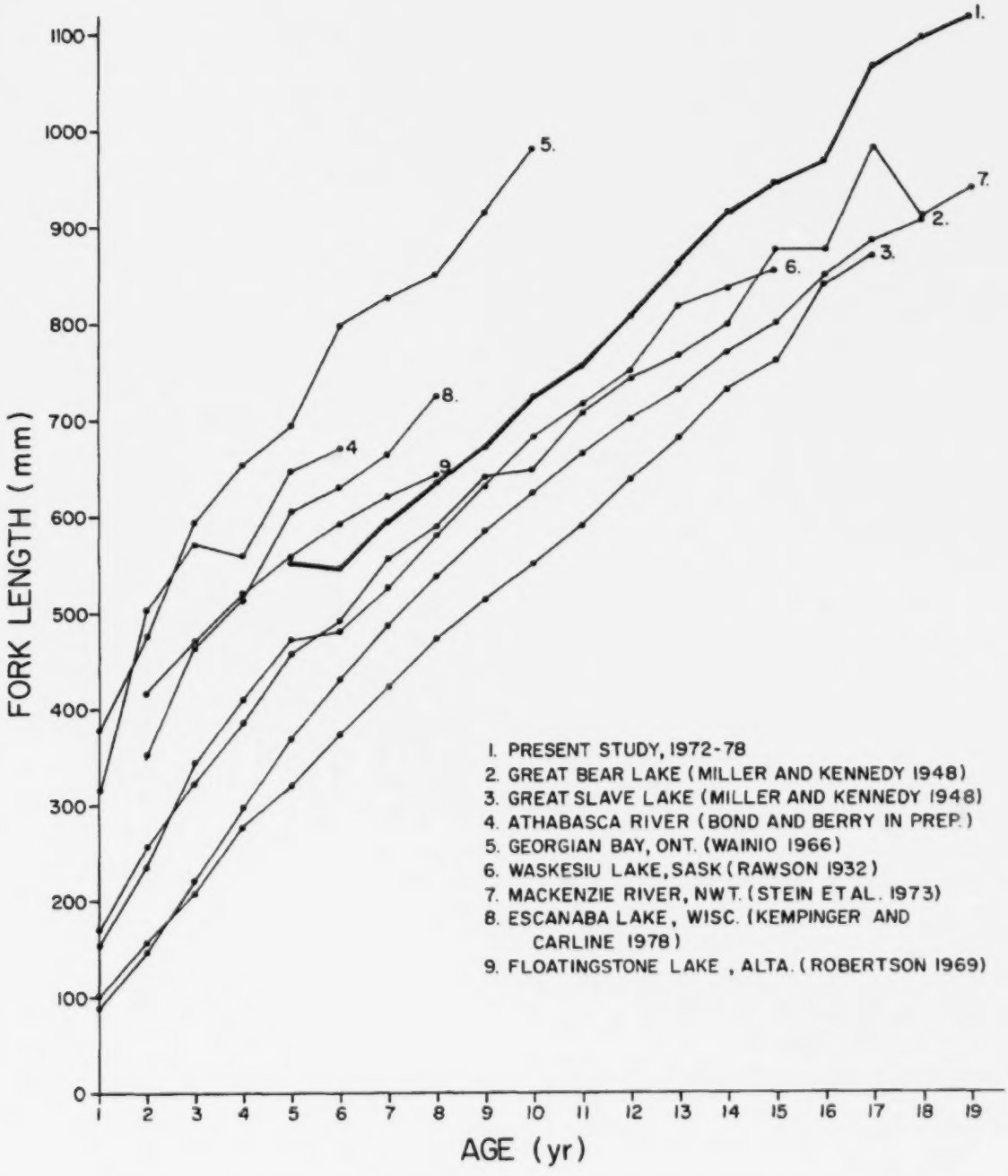

Fig. 11. Comparison of average growth rates for northern pike from the Beaver Lake area to other populations in North America.

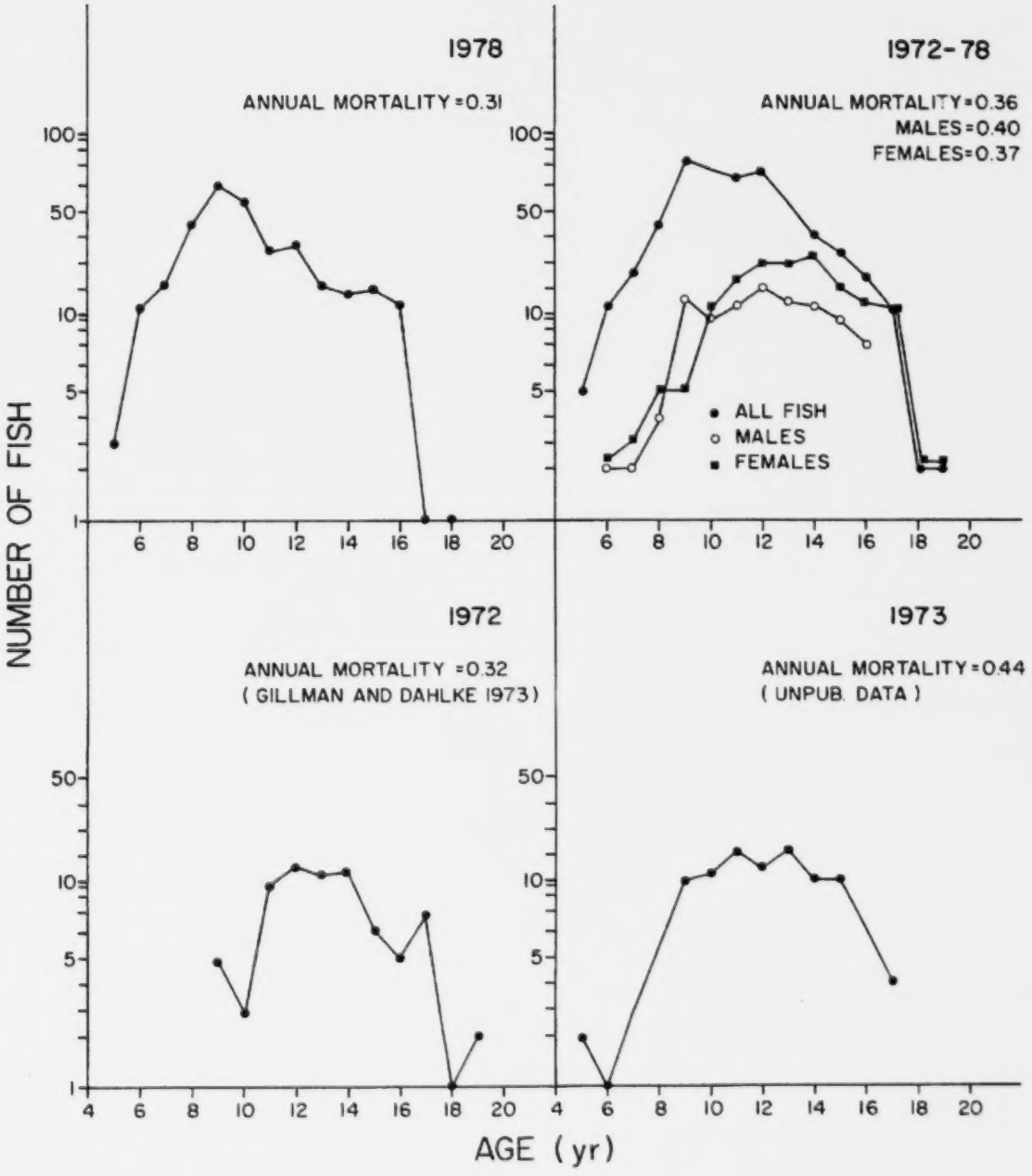

Fig. 12. Catch curves for angled northern pike from the Beaver Lake area, 1972-78.

Table 1. Summary of information pertaining to the fishing season and creel census period by year for the Brabant Island and Beaver Lake areas, 1972-78.

Year	Fishing Season					Creel Census						Angler Interviews (Census)		
	From (D/M/Y)	To (D/M/Y)	Days	Days Fished	% Fished	From (D/M/Y)	To (D/M/Y)	Days	% of Season	Days Censused	% of Census Worked	No. Conducted	No. Possible (Censused)	% Censused
1972 [a]	15/6/72	1/9/72	77	-	-	19/6/72	26/7/72	38	49	34	89	175	175	100
1973 [a]	10/6/73	25/8/73	76	50	65	19/6/73	20/8/73	56	33	30	54	212	390	54
1978	19/6/78	30/9/78	104	-	-	19/6/78	27/7/78	39	38	32	82	434	548	79

[a] Falk and Gillman 1974.

Table 2. Summary of catch and effort information obtained during creel census operations in the Brabant Island and Beaver Lake areas, 1972-78.

Year	Species	No. Sampled	Mean Weight (g)	No. Caught	No. Released	No. Retained	% Retained	Hours Fished	% Successful	Hours Fished/ Angler-Day	Catch/ Angler-Day	Catch/ Angler-Hr.	Fish Retained/ Angler Day
1972[a]	A. Grayling	326	779	698	175	523	74.9	355	100	2.03	3.52	1.73	2.63
	N. Pike	84	4310	1905	1758	147	7.7	661	-	3.78	10.87	2.87	0.84
1973[a]	A. Grayling	168	751	332	85	247	74.4	536	98	2.53	2.82	1.11	1.88
	N. Pike	117	4140	1443	1208	235	16.3	1199	-	5.66	9.63	1.70	1.57
1978	A. Grayling	136	842	1245	729	516	41.4	669	97	1.54	2.87	1.86	1.19
	N. Pike	108	4175	5710	5250	460	8.1	1994	100	4.59	13.16	2.86	1.06

[a] Falk and Gillman (1974).

Table 3. Summary of harvest estimates for Arctic grayling and northern pike caught by angling from the Brabant Island and Beaver Lake areas, 1972-78.

Year	No. Anglers	Species		Caught	Released	Release Mortality	Retained	Total Harvest	Hours Fished	Catch/ Angler	Fish/Retained/ Angler
1972[a]	175	A. Grayling	No.	1424	357	25	1067	1092	823	8.1	6.1
			Wt.(kg)	1109	278	19	831	851			
		N. Pike	No.	3888	3588	251	300	551	1354	122.2	1.7
			Wt.	16756	15463	1082	1291	2375			
1973[a]	175	A. Grayling	No.	851	218	15	633	648	766	4.8	3.6
			Wt.	639	164	12	44	487			
		N. Pike	No.	3700	3097	217	603	820	2176	21.1	3.4
			Wt.	15318	12823	898	2496	3395			
1978[b]	280	A. Grayling	No.	3202	1873	92	1327	1419	1722	11.4	4.7
			Wt.	2696	2577	77	1117	1195			
		N. Pike	No.	14678	13496	944	1182	2126	5132	52.4	4.2
			Wt.	61281	56346	3941	4935	8876			

[a] Falk and Gillman (1974).

[b] Estimates based on percent of season censused and on total number of guests at lodge.

Table 4. Length-weight relationship statistics for Arctic grayling caught by angling from the Brabant Island area, 1965-1978.

Year	Gear	Sex	N	Y-Intercept (a)	Slope (b)	s_b	95% C.I. of b
1965	Angling	Male	302	-4.7008	2.919	0.029	2.862 - 2.976
		Female	126	-4.7132	2.927	0.033	2.862 - 2.992
		Combined[a]	428	-4.6789	2.911	0.022	2.868 - 2.954
1966	Angling	Male	156	-4.6746	2.915	0.029	2.858 - 2.972
		Female	61	-4.7869	2.961	0.038	2 885 - 3.037
		Combined	238	-4.7640	2.950	0.024	2.903 - 2.997
1972	Angling	Male	148	-4.2821	2.749	0.076	2.646 - 2.822
		Female	63	-4.2047	2.719	0.103	2.513 - 2.925
		Combined	221	-4.3230	2.765	0.059	2.649 - 2.881
1973	Angling	Male	60	-4.1950	2.717	0.097	2.523 - 2.911
		Female	43	-3.9662	2.628	0.167	2.290 - 2.966
		Combined	163	-4.5131	2.838	0.047	2.746 - 2.930
1977	Angling	Male	66	-3.8769	2.607	0.112	2.383 - 2.631
		Female	48	-4.8020	2.959	0.063	2.832 - 3.806
		Combined	160	-4.9101	3.003	0.047	2.911 - 3.095
1978	Angling	Male	103	-6.3733	3.530	0.207	3.120 - 3.950
		Female	64	-9.0649	4.567	0.405	3.658 - 5.376
		Cominbed	167	-6.9948	3.771	0.196	3.387 - 4.155
1965-78	Angling	Male	835	-4.5342	2.851	0.024	2.804 - 2.898
		Female	405	-4.5750	2.868	0.031	2.808 - 2.928
		Combined	1397	-4.5643	2.863	0.017	2.830 - 2.896

[a] Includes fish of unknown sex.

Table 5. Annual mortality rates for Arctic grayling caught by angling from the Brabant Island area, 1965-78.

Year	Age-Classes Used	N	Survival (S)	SE of S	Var. of S	Annual Mortality Rate (A), Where A = 1-S
1965	8-11	221	0.3529	0.0259	0.0007	0.6471
1966	8-12	82	0.4214	0.0415	0.0017	0.5786
1972	6-9	176	0.3269	0.0290	0.0008	0.6731
1973	6-8	91	0.3793	0.0401	0.0016	0.6201
1977	6-11	131	0.5203	0.0302	0.0009	0.4797
1978	7-10	100	0.3613	0.0384	0.0015	0.6387

Table 6. Length-weight relationship statistics for northern pike caught by angling from the Beaver Lake area, 1972-78.

Year	Sex	N	Y-Intercept (a)	Slope (b)	s_b	95% C.I. of b
1972	Male	24	-4.6110	2.801	0.195	2.397 - 3.305
	Female	56	-5.0966	2.964	0.119	2.726 - 3.202
	Combined[a]	80	-4.9243	2.906	0.097	2.711 - 3.101
1973	Male	37	-4.6560	2.819	0.201	2.411 - 3.227
	Female	68	-5.3652	3.068	0.079	2.831 - 3.305
	Combined	116	-5.1373	2.990	0.065	2.861 - 3.119
1977	Male	38	-5.4112	3.091	0.138	2.811 - 3.319
	Female	42		2.910	0.084	2.740 - 3.080
	Combined	229	-5.1418	2.995	0.029	2.938 - 3.052
1978	Male	36	-6.5100	3.454	0.266	2.914 - 3.994
	Female	88	-6.1570	3.326	0.097	3.133 - 3.519
	Combined	130	-6.3080	3.379	0.080	3.222 - 3.536
1972-78	Male	135	-4.8983	2.904	0.086	2.735 - 3.073
	Female	254	-4.9687	2.926	0.034	2.859 - 2.993
	Combined	555	-4.9803	2.933	0.024	2.886 - 3.025

[a] Includes fish of unknown sex.

Table 7. Annual mortality rates for northern pike caught by angling from the Beaver Lake area, 1972-78.

Year	Age-Classes Used	N	Survival (S)	SE of S	Var. of S	Annual Mortality Rate (A), Where A = 1-S
1972	12-19	62	0.6823	0.0333	0.0011	0.3177
1973	13-17	51	0.5614	0.0460	0.0021	0.4386
1978	10-18	199	0.6872	0.0184	0.0003	0.3128

APPENDIX

Table A-1. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area 1965 (Bishop 1967).

Length Interval (mm)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
150-159	1	150	-	28	-	0.83	0.0	1	153	-	57	-	1.59	0.0	2	152	2.1	43	20.5	1.21	0.0	1.00
160-169	1	160	-	57	-	1.39	0.0	2	169	0.0	57	0.0	1.18	0.0	3	166	5.2	57	0.0	1.25	0.0	2.00
170-179	1	172	-	57	-	1.12	0.0	1	179	-	57	-	0.99	0.0	2	176	5.0	57	0.0	1.05	0.0	1.00
180-189	-	-	-	-	-	-	-	1	183	-	85	-	1.39	0.0	1	183	-	85	-	1.39	0.0	-
210-219	-	-	-	-	-	-	-	1	211	-	113	-	1.20	0.0	1	211	-	113	-	1.20	0.0	-
220-229	1	222	-	113	-	1.03	0.0	3	224	4.2	151	16.2	1.34	0.0	4	224	3.6	142	23.3	1.26	0.0	1.00
230-239	3	231	2.3	151	16.2	1.22	0.0	2	236	1.4	170	0.0	1.29	0.0	5	233	3.1	159	15.3	1.25	0.0	0.67
240-249	3	246	3.2	170	0.0	1.15	0.0	1	240	-	170	-	1.23	0.0	4	244	3.9	170	0.0	1.17	0.0	0.33
250-259	3	254	1.0	208	16.2	1.27	0.0	1	253	-	227	-	1.40	0.0	4	254	1.0	213	16.2	1.30	0.0	0.33
260-269	2	263	3.5	241	19.8	1.33	0.0	-	-	-	-	-	-	-	2	263	3.5	241	19.8	1.33	0.0	-
270-279	1	274	-	284	-	1.38	0.0	2	276	2.8	270	20.5	1.28	0.0	3	275	2.3	274	16.7	1.32	0.0	2.00
280-289	-	-	-	-	-	-	-	1	281	-	284	-	1.28	0.0	1	281	-	284	-	1.28	0.0	-
290-299	4	295	3.4	312	0.0	1.22	0.0	2	294	1.4	326	19.8	1.28	0.0	6	295	2.7	317	11.4	1.24	0.0	0.50
300-309	4	306	1.0	376	14.0	1.32	0.0	4	302	3.9	355	58.8	1.28	25.0	8	304	3.1	365	41.2	1.30	12.5	1.00
310-319	5	312	3.4	408	32.3	1.34	20.0	-	-	-	-	-	-	-	5	313	3.4	408	32.3	1.34	20.0	-
320-329	2	322	2.8	411	19.8	1.23	0.0	-	-	-	-	-	-	100.0	2	322	2.8	411	19.8	1.23	0.0	-
330-339	5	336	1.9	482	48.9	1.27	20.0	-	-	-	-	-	-	66.7	5	336	1.9	419	48.9	1.27	20.0	-
340-349	3	346	4.4	510	28.5	1.23	33.3	1	346	-	510	-	1.23	83.3	4	346	3.6	510	23.3	1.23	50.0	0.33
350-359	2	353	0.7	567	39.6	1.30	50.0	3	353	2.9	605	43.3	1.38	100.0	5	353	2.1	590	41.9	1.34	60.0	1.50
360-369	7	365	1.7	660	39.1	1.36	71.4	6	366	3.3	657	33.1	1.34	100.0	13	366	2.5	659	34.9	1.35	76.9	0.86
370-379	8	377	2.2	752	80.4	1.41	75.0	6	375	4.0	685	28.0	1.30	100.0	14	376	3.2	723	70.3	1.36	85.7	0.75
380-389	6	385	2.5	732	28.1	1.28	83.3	11	385	3.1	784	89.8	1.37	100.0	17	385	2.8	766	77.0	1.34	94.1	1.83
390-399	6	394	2.0	799	60.7	1.31	66.7	5	396	2.1	800	67.5	1.29	100.0	11	395	2.3	799	60.5	1.30	81.8	0.83
400-409	15	405	3.0	879	66.9	1.33	100.0	9	403	3.2	800	37.0	1.22	100.0	24	404	3.1	849	68.6	1.29	100.0	0.60
410-419	13	414	3.2	890	57.3	1.25	100.0	6	416	1.9	898	92.4	1.25	100.0	19	415	2.9	892	67.6	1.25	100.0	0.46
420-429	24	424	2.7	964	60.3	1.26	100.0	18	423	2.8	970	64.1	1.27	100.0	42	424	2.7	967	61.3	1.27	100.0	0.75
430-439	26	435	3.0	989	74.0	1.20	100.0	15	433	2.0	994	83.3	1.22	100.0	41	434	2.8	991	76.6	1.21	100.0	0.58
440-449	49	445	3.0	1060	85.3	1.20	100.0	8	446	2.2	1053	76.2	1.19	100.0	57	445	2.9	1059	83.5	1.20	100.0	0.16
450-459	42	454	2.8	1126	101.4	1.21	100.0	9	453	2.8	1093	97.2	1.17	100.0	51	454	2.7	1120	100.5	1.20	100.0	0.21
460-469	33	464	2.8	1157	83.0	1.16	100.0	6	463	1.8	1025	63.8	1.21	100.0	39	464	2.6	1165	81.5	1.17	100.0	0.18
470-479	22	474	2.4	1201	63.4	1.13	100.0	1	479	-	1191	-	1.08	100.0	23	474	2.5	1201	62.0	1.13	100.0	0.05
480-489	6	482	2.7	1337	112.7	1.20	100.0	-	-	-	-	-	-	-	6	482	2.7	1337	112.7	1.20	100.0	-
490-499	4	494	4.0	1418	103.5	1.18	100.0	-	-	-	-	-	-	-	4	494	4.0	1418	103.5	1.18	100.0	-
Total	302							126							428						84.6	0.42
Mean		418	61.9	941	296.6	1.23	85.4		385	74.6	787	315.9	1.26	81.8		409	67.6	896	310.1	1.24		

Table A-2. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1966 (Bishop 1967).

Length Interval (mm)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
140-149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	148	-	28	-	0.86	-	-	1
190-199	-	-	-	-	-	-	-	1	199	-	85	-	1.08	0.0	1	199	-	85	-	1.08	0.0	-	-
200-209	-	-	-	-	-	-	-	2	206	0.7	113	0.0	1.30	0.0	2	206	0.7	113	0.0	1.30	0.0	-	-
210-219	2	213	4.2	128	20.5	1.32	0.0	-	-	-	-	-	-	-	2	213	4.2	128	20.5	1.32	0.0	-	-
220-229	3	223	4.0	142	0.0	1.28	0.0	1	226	-	170	-	1.47	0.0	4	224	3.6	149	14.0	1.33	0.0	0.33	-
230-239	7	234	2.8	166	19.6	1.30	0.0	3	238	1.0	180	16.7	1.33	0.0	10	235	3.1	170	19.0	1.31	0.0	0.43	-
240-249	1	247	-	199	-	1.32	0.0	2	245	4.2	199	0.0	1.36	0.0	3	246	3.2	199	0.0	1.34	0.0	2.00	-
250-259	1	250	-	199	-	1.27	0.0	-	-	-	-	-	-	-	1	250	-	199	-	1.27	0.0	-	-
260-269	2	263	0.7	213	19.8	1.18	0.0	1	266	-	227	-	1.21	0.0	4	263	1.9	220	14.0	1.21	-	0.50	1
270-279	3	272	2.0	246	16.2	1.22	0.0	-	-	-	-	-	-	-	4	273	2.6	262	36.7	1.29	-	-	1
280-289	5	286	3.4	301	15.3	1.29	0.0	4	284	1.6	312	22.9	1.36	0.0	12	286	2.7	314	25.4	1.35	-	0.80	3
290-299	4	295	1.5	348	27.3	1.35	0.0	4	293	2.6	333	14.0	1.32	0.0	10	295	2.6	337	21.0	1.32	-	1.00	2
300-309	6	304	3.2	369	31.0	1.32	0.0	3	302	1.0	350	43.3	1.27	0.0	11	303	2.6	361	31.4	1.30	-	0.50	2
310-319	4	315	3.3	432	14.5	1.39	25.0	-	-	-	-	-	-	-	7	314	3.5	425	23.3	1.37	-	-	3
320-329	2	327	2.8	454	0.0	1.30	50.0	-	-	-	-	-	-	-	5	324	3.6	459	30.9	1.36	-	-	3
330-339	1	332	-	652	-	1.78	100.0	-	-	-	-	-	-	-	5	335	3.3	544	64.6	1.45	-	-	4
340-349	2	346	5.0	581	19.8	1.41	100.0	1	349	-	595	-	1.40	100.0	3	347	4.0	586	16.2	1.41	100.0	0.50	-
350-359	1	353	-	510	-	1.16	0.0	4	355	3.7	603	48.3	1.34	100.0	5	355	3.4	584	58.4	1.31	90.0	4.00	-
360-369	4	365	4.2	631	14.0	1.30	100.0	1	360	-	624	-	1.34	100.0	6	364	4.1	629	11.4	1.30	-	0.25	1
370-379	6	375	3.3	681	35.9	1.29	100.0	2	374	2.1	695	20.5	1.33	100.0	8	375	3.0	684	32.0	1.30	100.0	0.33	-
380-389	10	384	3.0	754	35.9	1.33	100.0	3	380	0.0	746	71.5	1.36	100.0	13	383	3.2	753	42.8	1.34	100.0	0.30	-
390-399	8	394	2.9	822	56.9	1.35	100.0	1	399	-	766	-	1.21	100.0	9	394	3.2	816	56.4	1.33	100.0	0.13	-
400-409	10	403	2.3	851	48.1	1.30	100.0	5	405	3.4	862	32.2	1.30	100.0	15	403	2.9	854	42.6	1.30	100.0	0.50	-
410-419	8	415	3.5	922	82.9	1.29	100.0	9	413	2.5	907	51.2	1.29	100.0	17	414	3.0	914	66.1	1.29	100.0	1.13	-
420-429	11	425	3.5	992	63.4	1.30	100.0	7	424	3.7	948	15.0	1.24	100.0	18	424	3.5	975	54.2	1.28	100.0	0.64	-
430-439	15	434	3.1	1015	53.7	1.24	100.0	-	-	-	-	-	-	-	15	434	3.1	1015	53.7	1.24	100.0	-	-
440-449	12	446	1.4	1120	75.9	1.26	100.0	3	447	2.7	1172	43.3	1.31	100.0	15	446	1.7	1130	72.5	1.27	100.0	0.25	-
450-459	10	453	2.8	1097	76.7	1.18	100.0	4	454	3.6	1177	154.4	1.26	100.0	14	453	3.0	1120	104.7	1.21	100.0	0.40	-
460-469	12	464	3.2	1193	113.1	1.20	100.0	-	-	-	-	-	-	-	12	464	2.5	1193	113.1	1.20	100.0	-	-
470-479	4	474	3.2	1354	48.6	1.27	100.0	-	-	-	-	-	-	-	4	474	3.2	1354	48.6	1.27	100.0	-	-
480-489	2	484	5.7	1276	120.2	1.12	100.0	-	-	-	-	-	-	-	2	484	5.7	1276	120.2	1.12	100.0	-	-
Total	156						75.0	61						65.6	238						-	0.39	21
Mean		384	73.7	788	350.9	1.28			357	76.2	666	342.6	1.30			370	75.7	722	353.3	1.29			

Table A-3. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1972 (Falk and Gillman 1974).

Length Interval (mm)	Males							Females							Combined							F/M Ratio	No. Unknown
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.		
240-249	1	249	-	190	-	1.23	-	-	-	-	-	-	-	-	1	249	-	190	-	1.23	-	-	-
250-259	1	255	-	200	-	1.21	-	-	-	-	-	-	-	-	1	255	-	200	-	1.21	-	-	-
290-299	1	290	-	285	-	1.17	-	2	290	0.0	338	88.4	1.38	-	3	290	0.0	320	69.5	1.31	-	2.00	-
300-309	2	300	0.0	345	63.6	1.28	-	4	303	2.9	349	43.3	1.26	-	6	302	2.6	348	44.0	1.27	-	2.00	-
310-319	4	311	2.5	361	50.1	1.20	-	2	314	5.0	383	46.0	1.24	-	6	312	3.2	368	45.2	1.21	-	0.50	-
320-329	-	-	-	-	-	-	-	2	323	3.5	378	38.9	1.12	-	2	323	3.5	378	38.9	1.12	-	-	-
340-349	1	340	-	500	-	1.27	-	1	340	-	425	-	1.08	-	2	340	0.0	463	53.0	1.18	-	1.00	-
350-359	1	352	-	515	-	1.18	-	1	350	-	475	-	1.08	-	2	351	1.4	495	28.3	1.14	-	1.00	-
360-369	-	-	-	-	-	-	-	1	360	-	600	-	1.29	-	1	360	-	600	-	1.29	-	-	-
370-379	5	374	2.2	592	10.4	1.13	-	7	373	2.7	604	33.6	1.17	-	12	373	2.5	599	26.3	1.15	-	1.40	-
380-389	10	385	1.8	648	39.6	1.14	-	6	384	2.2	648	48.7	1.15	-	16	384	1.9	648	41.6	1.14	-	0.60	-
390-399	8	393	3.3	769	100.1	1.27	-	10	393	2.8	749	69.4	1.23	-	18	393	2.9	758	82.4	1.25	-	1.25	-
400-409	18	403	2.9	792	102.0	1.21	-	8	402	2.5	754	57.1	1.16	-	27	403	2.8	789	98.8	1.21	-	0.44	1
410-419	18	413	2.9	834	99.7	1.19	-	8	411	1.8	789	63.1	1.14	-	26	412	2.8	820	91.2	1.17	-	0.44	-
420-429	25	423	2.7	865	67.7	1.14	-	7	424	3.6	869	71.6	1.14	-	33	423	2.9	871	73.7	1.15	-	0.28	1
430-439	20	432	2.2	926	74.2	1.15	-	2	430	0.0	863	17.7	1.09	-	23	432	2.2	925	76.4	1.15	-	0.10	1
440-449	16	444	2.9	953	73.6	1.09	-	1	440	-	925	-	1.09	-	20	443	3.0	972	94.0	1.12	-	0.06	3
450-459	11	452	2.9	1007	52.9	1.09	-	1	450	-	1035	-	1.14	-	15	452	2.7	1024	61.9	1.11	-	0.09	3
460-469	4	461	1.4	1075	150.0	1.10	-	-	-	-	-	-	-	-	5	461	1.2	1080	130.4	1.10	-	-	1
470-479	2	743	3.5	1125	176.8	1.07	-	-	-	-	-	-	-	-	2	473	3.5	1125	176.8	1.07	-	-	-
Total	148						-	63						-	221							0.43	10
Mean		412	38.9	822	191.7	1.16			384	39.9	679	181.5	1.18			405	41.4	793	204.7	1.17			

Table A-4. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1973 (Falk and Gillman 1974).

Length Interval (mm)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
210-219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	215	-	120	-	1.21	-	-	1
220-229	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	225	-	140	-	1.23	-	-	1
240-249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	248	-	160	-	1.05	-	-	1
250-259	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	251	1.4	180	-	1.14	-	-	2
290-299	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	299	-	320	-	1.20	-	-	1
310-319	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	317	-	380	-	1.19	-	-	1
320-329	1	325	-	400	-	1.17	-	3	327	2.0	427	23.1	1.22	-	7	325	3.0	420	20.0	1.23	-	3.00	3
330-339	2	331	0.7	425	7.1	1.18	-	-	-	-	-	-	-	-	6	332	2.2	435	42.8	1.18	-	-	4
340-349	3	345	4.0	497	5.8	1.21	-	3	343	2.5	500	20.0	1.24	-	7	344	2.9	493	18.9	1.21	-	1.00	1
350-359	2	252	0.0	510	14.1	1.17	-	1	351	-	530	-	1.23	-	6	353	2.7	535	23.5	1.21	-	0.50	3
360-369	1	361	-	600	-	1.28	-	1	362	-	640	-	1.35	-	6	362	1.5	593	46.8	1.25	-	1.00	4
370-379	2	377	2.8	660	56.7	1.23	-	1	370	-	620	-	1.22	-	5	373	3.8	652	36.3	1.26	-	0.50	2
380-389	1	389	-	700	-	1.19	-	2	384	5.0	760	198.0	1.34	-	5	385	3.5	732	102.6	1.28	-	2.00	2
390-399	4	395	3.9	735	66.1	1.19	-	7	395	3.6	729	28.0	1.19	-	16	394	3.3	719	45.3	1.17	-	1.75	5
400-409	5	406	2.0	804	51.8	1.21	-	3	404	3.2	670	88.9	1.02	-	12	405	2.4	772	80.1	1.16	-	0.60	4
410-419	12	415	2.5	854	76.6	1.19	-	7	415	3.0	799	72.2	1.12	-	23	415	2.5	833	73.9	1.16	-	0.58	4
420-429	4	427	0.5	930	62.7	1.19	-	3	422	1.5	960	124.9	1.27	-	13	425	2.9	915	73.2	1.19	-	0.75	6
430-439	6	435	2.9	967	54.7	1.18	-	8	435	1.9	934	76.9	1.13	-	24	434	2.3	930	63.2	1.14	-	1.33	10
440-449	8	446	2.7	945	61.0	1.07	-	2	448	0.7	1065	21.2	1.19	-	12	446	2.7	977	69.6	1.16	-	0.25	2
450-459	5	456	3.5	1050	64.0	1.11	-	-	-	-	-	-	-	-	7	454	3.8	1036	90.2	1.11	-	-	2
460-469	2	465	0.7	1105	63.6	1.10	-	1	464	-	920	-	0.9	-	4	465	1.4	1045	94.7	1.04	-	0.50	1
470-479	2	474	1.4	1200	84.9	1.13	-	-	-	-	-	-	-	-	2	474	1.4	1200	84.9	1.13	-	-	-
480-489	-	-	-	-	-	-	-	1	485	-	1340	-	1.18	-	1	485	-	1340	-	1.18	-	1.00	-
Total	60						-	43						-	163						-	0.71	60
Mean		414	37.8	842	198.0	1.17			403	37.7	780	202.6	1.17			399	49.0	768	229.4	1.17			

Table A-5. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1977 (RRCSL 1978).

Length Interval (mm)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
190-199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	190	-	100	-	1.46	-	-	1
210-219	-	-	-	-	-	-	-	1	215	-	140	-	1.41	0.0	2	216	1.4	130	-	1.29	-	-	1
230-239	-	-	-	-	-	-	-	2	238	0.7	180	0.0	1.34	50.0	3	236	3.2	177	5.8	1.35	-	-	1
240-249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	244	4.7	183	5.8	1.27	-	-	3
250-259	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	259	-	240	-	1.38	-	-	1
270-279	-	-	-	-	-	-	-	4	276	3.4	255	5.8	1.21	75.0	6	275	3.0	253	5.2	1.22	-	-	2
290-299	-	-	-	-	-	-	-	1	297	-	300	-	1.15	0.0	2	294	4.2	300	0.0	1.18	-	-	1
300-309	-	-	-	-	-	-	-	2	304	4.2	350	0.0	1.25	100.0	4	304	3.2	350	24.5	1.24	-	-	2
310-319	1	316	-	420	-	1.33	100.0	-	-	-	-	-	-	-	6	315	2.1	387	39.8	1.24	-	-	5
320-329	-	-	-	-	-	-	-	3	324	2.5	403	37.9	1.18	100.0	4	323	2.4	398	33.0	1.17	-	-	1
330-339	-	-	-	-	-	-	-	2	336	5.0	420	28.3	1.11	100.0	4	334	3.9	440	32.7	1.18	-	-	2
340-349	-	-	-	-	-	-	-	5	342	2.9	498	48.2	1.24	100.0	7	343	2.7	507	42.7	1.25	-	-	2
350-359	3	355	1.5	567	47.3	1.26	100.0	-	-	-	-	-	-	-	7	356	1.6	569	28.5	1.27	-	-	4
360-369	1	365	-	580	-	1.19	100.0	-	-	-	-	-	-	-	2	365	0.0	585	7.1	1.20	-	-	1
370-379	1	370	-	680	-	1.34	100.0	7	375	2.4	670	41.2	1.27	100.0	11	374	2.9	664	41.1	1.27	-	7.00	3
380-389	2	382	0.0	765	21.2	1.37	100.0	3	387	1.5	707	40.4	1.22	100.0	7	385	3.2	743	43.1	1.30	-	1.50	2
390-399	6	395	2.7	808	59.5	1.31	100.0	2	292	1.4	800	70.7	1.33	100.0	14	395	2.7	812	55.1	1.32	-	0.33	6
400-409	8	405	4.1	866	68.0	1.31	100.0	3	403	2.5	790	50.0	1.20	100.0	20	405	3.4	838	65.3	1.26	-	0.38	9
410-419	7	413	3.2	889	74.0	1.26	100.0	9	414	2.9	918	43.0	1.29	100.0	25	414	2.9	901	60.7	1.27	-	1.29	9
420-429	9	424	3.5	914	78.3	1.20	100.0	1	426	-	850	-	1.10	100.0	13	425	3.1	928	88.3	1.21	-	0.11	3
430-439	4	436	2.9	980	63.3	1.19	100.0	3	433	3.6	960	173.5	1.18	100.0	10	435	2.8	978	91.3	1.19	-	0.75	3
440-449	6	444	3.6	1073	92.7	1.23	100.0	-	-	-	-	-	-	-	8	443	3.2	1096	90.1	1.26	-	-	2
450-459	4	452	1.6	1095	103.4	1.19	100.0	-	-	-	-	-	-	-	5	453	3.0	1102	90.9	1.18	-	-	1
460-469	5	463	3.8	1144	83.9	1.15	100.0	-	-	-	-	-	-	-	5	463	3.8	1144	83.9	1.15	-	-	-
470-479	9	473	3.8	1273	91.4	1.21	100.0	-	-	-	-	-	-	-	9	473	3.8	1273	91.4	1.21	-	-	-
490-499	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	496	-	1580	-	1.30	-	-	1
Total	66						100.0	48						91.7	180						-	0.72	66
Mean		424	35.1	956	209.0	1.24			360	57.4	622	260.7	1.24			386	61.1	765	300.7	1.25			

Table A-6. Mean fork length, mean weight, condition factor (K), maturity and sex ratio for Arctic grayling caught by angling from the Brabant Island area, 1978.

Length Interval (mm)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
350-359	2	358	1.4	450	70.7	0.88	50.0	-	-	-	-	-	-	-	2	358	1.4	450	70.7	0.88	50.0	-
360-369	2	361	1.4	400	70.7	0.85	100.0	1	362	-	350	-	0.74	100.0	3	361	1.2	383	57.7	0.81	100.0	0.50
370-379	1	375	-	500	-	0.95	100.0	1	379	-	500	-	0.92	100.0	2	377	2.8	500	-	0.93	100.0	1.00
380-389	9	385	2.6	614	128.9	1.08	88.9	5	385	3.1	560	138.7	0.98	100.0	14	385	2.6	595	130.0	1.04	92.9	0.56
390-399	6	393	2.5	583	51.6	0.96	100.0	3	395	4.0	567	57.7	0.92	100.0	9	394	3.0	578	50.7	0.95	100.0	0.50
400-409	6	404	3.5	600	63.2	0.91	100.0	5	403	2.7	854	131.8	1.30	100.0	11	403	3.0	716	162.9	1.09	100.0	0.83
410-419	12	414	3.5	747	165.5	1.05	100.0	14	413	2.8	721	97.5	1.03	100.0	26	413	3.2	733	131.0	1.04	100.0	1.17
420-429	14	424	3.5	862	79.8	1.13	100.0	9	424	2.6	903	197.4	1.18	100.0	23	424	3.1	878	135.5	1.15	100.0	0.64
430-439	9	433	3.4	861	78.2	1.06	100.0	12	434	2.6	983	154.4	1.21	100.0	21	434	2.9	931	139.1	1.14	100.0	1.33
440-449	20	444	3.1	942	131.9	1.07	95.0	8	443	3.7	1094	169.7	1.26	100.0	28	444	3.2	985	156.8	1.13	96.4	0.40
450-459	14	454	3.0	1034	142.2	1.10	100.0	4	452	2.2	1088	209.7	1.18	100.0	18	454	2.9	1046	154.1	1.12	100.0	0.29
460-469	5	464	1.6	1080	83.7	1.08	100.0	2	464	5.7	1135	21.2	1.14	100.0	7	464	2.7	1096	73.9	1.10	100.0	0.40
470-479	2	474	2.1	1000	141.4	0.94	100.0	-	-	-	-	-	-	-	2	474	2.1	1000	141.4	0.94	100.0	-
480-489	1	480	-	1300	-	1.18	100.0	-	-	-	-	-	-	-	1	480	-	1300	-	1.18	100.0	-
Total	103						97.1	64						100.0	167						98.2	0.62
Mean		426	28.3	831	213.5	1.06			421	22.0	860	237.2	1.13			424	26.1	842	222.6	1.09		

Table A-7. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for Arctic grayling caught by angling from the Brabant Island area, 1965-78.

Length Interval (mm)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
140-149	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	148	-	28	-	0.86	-	-	1
150-159	1	150	-	28	-	0.83	-	1	153	-	57	-	1.59	-	2	152	2.1	43	20.5	1.21	-	1.00	-
160-169	1	160	-	57	-	1.39	-	2	169	0.0	57	0.0	1.18	-	3	166	5.2	57	0.0	1.25	-	2.00	-
170-179	1	172	-	57	-	1.12	-	1	179	-	57	-	0.99	-	2	176	5.0	57	0.0	1.06	-	1.00	-
180-189	-	-	-	-	-	-	-	1	183	-	85	-	1.39	-	1	183	-	85	-	1.39	-	-	-
190-199	-	-	-	-	-	-	-	1	199	-	85	-	1.08	-	2	195	6.4	93	10.6	1.27	-	-	1
200-209	-	-	-	-	-	-	-	2	206	0.7	113	0.0	1.30	-	2	206	0.7	113	0.0	1.31	-	-	-
210-219	2	213	4.2	128	20.5	1.32	-	2	213	2.8	127	19.1	1.31	-	6	214	2.8	125	13.1	1.27	-	1.00	2
220-229	4	223	3.4	135	14.5	1.22	-	4	225	3.5	156	16.2	1.37	-	9	224	3.1	145	17.1	1.29	-	1.00	1
230-239	10	233	2.8	162	19.1	1.28	-	7	237	1.3	177	10.8	1.32	-	18	235	3.1	168	17.1	1.29	-	0.70	1
240-249	5	247	2.7	180	13.8	1.20	-	3	243	4.2	189	16.7	1.31	-	12	245	3.6	181	13.7	1.23	-	0.60	4
250-259	5	253	2.1	205	12.4	1.26	-	1	253	-	227	-	1.40	-	9	253	2.8	206	21.1	1.26	-	0.20	3
260-269	4	263	2.1	227	22.9	1.25	-	1	266	-	227	-	1.21	-	6	263	2.2	227	17.7	1.25	-	0.25	1
270-279	4	273	1.9	255	23.3	1.26	-	6	279	2.9	260	12.7	1.24	-	13	275	2.7	261	21.2	1.26	-	1.50	3
280-289	5	286	3.4	301	15.3	1.29	-	5	283	2.0	306	23.4	1.35	-	13	285	2.9	312	25.7	1.35	-	1.00	3
290-299	9	295	2.8	325	28.6	1.27	-	9	293	2.7	329	35.1	1.31	-	22	294	3.1	325	28.9	1.28	-	1.00	4
300-309	12	304	2.9	367	31.3	1.31	-	13	303	2.8	351	40.6	1.27	-	29	303	2.8	358	35.1	1.29	-	1.08	4
310-319	14	313	3.2	403	42.2	1.31	-	2	314	5.0	383	46.0	1.24	-	25	314	3.1	397	39.6	1.29	-	0.14	8
320-329	5	325	3.2	426	27.8	1.25	-	8	325	2.9	406	34.6	1.18	-	20	324	2.9	420	36.3	1.24	-	1.60	7
330-339	8	334	3.0	489	79.9	1.31	-	2	336	5.0	420	28.3	1.11	-	20	334	3.0	475	63.9	1.27	-	0.25	10
340-349	9	345	3.9	520	38.5	1.27	-	11	343	3.0	502	49.8	1.24	-	23	344	3.3	510	43.6	1.25	-	1.22	3
350-359	11	354	2.3	525	56.6	1.19	-	9	353	3.3	581	59.3	1.32	-	27	354	2.7	554	54.6	1.25	-	0.82	7
360-369	15	364	2.8	608	93.9	1.26	-	10	364	3.7	616	98.4	1.27	-	31	364	3.0	607	86.2	1.26	-	0.67	6
370-379	23	375	2.8	676	87.3	1.28	-	24	374	3.1	647	56.7	1.24	-	52	374	3.1	660	71.1	1.26	-	1.04	5
380-389	38	385	2.5	689	89.4	1.21	-	30	384	3.1	706	121.3	1.24	-	72	385	2.8	699	102.1	1.23	-	0.79	4
390-399	38	394	2.8	758	103.9	1.24	-	28	394	3.1	738	85.0	1.20	-	77	394	2.9	751	94.0	1.23	-	0.74	11
400-409	62	404	3.1	814	107.6	1.24	-	33	403	2.9	794	84.5	1.21	-	109	404	3.0	811	97.0	1.23	-	0.53	14
410-419	70	414	3.1	848	111.6	1.20	-	53	413	2.9	827	107.2	1.17	-	136	414	3.0	842	107.0	1.19	-	0.76	13
420-429	87	424	3.0	916	83.8	1.20	-	45	424	2.9	934	108.4	1.23	-	142	424	3.0	923	92.4	1.21	-	0.52	10
430-439	80	434	3.1	962	82.6	1.18	-	40	434	2.5	970	113.9	1.19	-	134	434	2.8	961	91.4	1.18	-	0.50	14
440-449	111	445	2.9	1022	110.6	1.16	-	22	445	3.2	1079	120.3	1.22	-	140	445	3.0	1035	113.6	1.18	-	0.20	9
450-459	86	453	2.9	1086	108.3	1.17	-	18	453	2.8	1107	134.3	1.19	-	110	453	2.9	1089	112.0	1.17	-	0.21	6
460-469	61	463	2.6	1150	97.0	1.16	-	9	463	2.5	1158	107.1	1.16	-	72	464	2.6	1149	97.0	1.15	-	0.15	2
470-479	41	474	2.7	1218	104.6	1.15	-	1	479	-	1191	-	1.08	-	42	474	2.8	1218	103.4	1.15	-	0.02	-
480-489	9	482	3.2	1319	102.4	1.18	-	1	485	-	1340	-	1.18	-	10	482	3.2	1321	96.8	1.18	-	0.11	-
490-499	4	494	4.0	1418	103.5	1.18	-	-	-	-	-	-	-	-	5	494	3.7	1450	115.4	1.20	-	-	1
Total	835						-	405						-	1397						-	0.49	157
Mean		412	56.2	872	277.8	1.20			386	62.2	743	283.7	1.22			399	61.3	812	291.6	1.21			

Table A-8. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1965 (Bishop 1967).

Age (Yr)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
1	3	161	11.0	47	16.7	1.11	0.0	5	171	11.6	63	12.5	1.27	0.0	8	167	11.8	56	15.2	1.21	0.0	1.67
2	10	244	14.4	182	44.8	1.23	0.0	8	231	13.0	163	33.1	1.30	0.0	18	238	14.9	173	40.0	1.26	0.0	0.80
3	13	293	21.4	327	77.3	1.27	0.0	8	291	12.2	306	38.4	1.25	12.5	21	293	18.1	320	64.7	1.26	4.8	0.62
4	12	334	14.3	468	58.5	1.26	16.7	5	351	30.9	584	114.7	1.35	60.0	17	339	21.1	502	92.9	1.29	29.4	0.42
5	17	369	22.4	679	112.8	1.34	70.6	10	375	8.7	715	62.5	1.36	100.0	27	371	18.5	692	97.4	1.35	81.5	0.59
6	21	400	17.6	839	102.4	1.31	90.5	19	394	27.0	791	146.7	1.28	94.7	40	397	22.4	816	126.1	1.30	92.5	0.91
7	46	425	19.8	949	120.0	1.23	97.8	30	414	17.9	897	110.8	1.26	100.0	76	421	19.7	928	118.5	1.25	98.7	0.65
8	96	446	17.1	1070	111.8	1.21	100.0	29	436	15.3	1026	114.3	1.24	100.0	125	444	17.2	1060	113.5	1.22	100.0	0.30
9	67	457	15.6	1130	126.2	1.19	100.0	10	452	10.1	1086	115.6	1.17	100.0	77	456	15.0	1124	125.1	1.18	100.0	0.15
10	15	468	15.9	1223	128.9	1.19	100.0	1	465	-	1276	-	1.27	100.0	16	468	15.4	1126	125.3	1.20	100.0	0.07
11	1	491	-	1304	-	1.10	100.0	-	-	-	-	-	-	-	1	491	-	1304	-	1.10	100.0	-
12	1	499	-	1531	-	1.23	100.0	1	479	-	1191	-	1.08	100.0	2	489	14.1	1361	240.4	1.16	100.0	1.00
Total	302						85.4	126						81.7	428						84.3	0.42
Mean	7.2[a]	418	61.9	941	296.6	1.23		6.2[a]	385	74.6	787	315.9	1.26		6.9[a]	409	67.6	896	310.1	1.24		

[a] Indicates mean age.

Table A-9. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1966 (Bishop 1967).

Age (Yr)	Males							Females							Combined							
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	148	-	28	-	0.86	0.0	-	1
2	14	231	11.1	160	26.5	1.30	0.0	8	225	19.3	156	45.8	1.33	0.0	22	229	14.4	159	33.7	1.31	0.0	0.57	-
3	19	291	15.9	326	65.7	1.30	0.0	11	283	17.6	307	61.8	1.33	0.0	43	291	17.8	331	67.9	1.32	-	0.58	13
4	11	330	33.8	495	153.3	1.34	63.3	4	326	27.4	447	141.5	1.26	75.0	21	329	26.6	485	125.1	1.34	-	0.36	6
5	9	374	22.3	715	124.4	1.36	88.9	6	367	11.6	676	82.9	1.36	100.0	16	371	18.0	695	106.2	1.36	-	0.67	1
6	26	392	19.8	801	124.0	1.32	96.2	8	393	19.0	790	95.3	1.30	100.0	34	392	19.3	798	116.6	1.31	97.1	0.31	-
7	14	413	20.2	909	139.1	1.28	100.0	5	415	9.6	902	51.0	1.26	100.0	19	414	17.7	908	120.7	1.27	100.0	0.36	-
8	26	437	19.6	1044	144.1	1.24	100.0	16	426	16.2	973	97.5	1.26	100.0	42	433	19.1	1017	131.7	1.25	100.0	0.62	-
9	25	445	13.5	1076	93.9	1.22	100.0	2	454	7.1	1276	160.5	1.36	100.0	27	446	13.2	1091	109.3	1.23	100.0	0.08	-
10	7	461	15.0	1231	127.9	1.26	100.0	1	444	-	1219	-	1.39	100.0	8	459	15.1	1230	118.5	1.28	100.0	0.14	-
11	4	470	9.5	1262	67.6	1.22	100.0	-	-	-	-	-	-	-	4	470	9.5	1262	67.6	1.22	100.0	-	-
12	1	488	-	1361	-	1.17	100.0	-	-	-	-	-	-	-	1	488	-	1361	-	1.17	100.0	-	-
Total	156						75.0	61				342.6		67.2	238						-	0.39	21
Mean	6.3[a]	384	73.7	788	350.9	1.28		5.5[a]	357	76.2	666		1.30		5.8[a]	370	75.7	722	353.3	1.29			

[a] Indicates mean age.

Table A-10. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1972 (Falk and Gillman 1974).

Age (Yr)	Males							Females							Combined							F/M Ratio	No. Unknown
		Length(mm)		Weight(g)			% Mat.[b]		Length(mm)		Weight(g)			% Mat.[b]		Length(mm)		Weight(g)			% Mat		
	N	Mean	SD	Mean	SD	K		N	Mean	SD	Mean	SD	K		N	Mean	SD	Mean	SD	K			
3	2	252	4.2	195	7.1	1.22	0	1	290	-	275	-	1.13	0	3	265	22.2	222	46.5	1.19	0	0.50	-
4	6	310	21.7	357	86.9	1.18	50	5	310	8.3	366	36.0	1.23	80	11	310	16.2	361	65.7	1.20	64	0.83	-
5	17	389	37.0	691	167.0	1.16	94	14	358	38.7	570	157.4	1.23	100	31	375	40.3	636	171.3	1.19	97	0.82	-
6	72	416	21.5	831	121.3	1.16	96	36	400	103.7	742	103.7	1.15	100	109	411	21.7	803	123.6	1.16	-	0.50	1
7	40	431	20.7	936	131.3	1.17	98	7	417	25.9	857	160.4	1.17	100	53	430	21.1	943	141.8	1.18	-	0.18	6
8	8	435	22.0	930	154.8	1.12	100	-	-	-	-	-	-	-	10	438	21.0	954	147.5	1.13	-	-	2
9	3	443	7.2	900	90.1	1.03	100	-	-	-	-	-	-	-	4	445	6.8	950	124.2	1.08	-	-	1
Total	148						-	63						-	221						-	0.43	10
Mean	6.2[a]	412	38.9	822	191.7	1.16		5.7[a]	384	39.9	822	191.7	1.16		6.1[a]	405	41.1	793	204.7	1.17			

[a] Indicates mean age.
[b] Maturity based on entire sample (includes fish of unknown len. and wt.).

Table A-11. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1973 (Falk and Gillman 1974).

Age (Yr)	Males							Females							Combined							F/M Ratio	No. Unknown
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.[b]	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.[b]	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.[b]		
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	220	7.1	130	14.1	1.22	-	-	2
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	250	2.0	173	11.6	1.11	-	-	3
4	2	328	4.2	410	14.1	1.16	50	-	-	-	-	-	-	-	8	321	10.3	405	42.4	1.22	-	-	6
5	1	352	-	500	-	1.15	60	6	349	24.1	537	121.6	1.25	88	14	348	17.2	517	92.8	1.21	-	6.00	7
6	8	418	14.3	853	91.9	1.17	88	9	399	19.2	734	86.5	1.16	85	44	408	23.3	795	116.2	1.17	-	1.13	27
7	20	437	21.2	968	116.8	1.16	100	6	441	25.3	1028	194.0	1.19	100	39	434	23.4	949	142.0	1.16	-	0.30	13
8	5	440	18.9	944	114.4	1.10	100	2	435	0.0	960	0.0	1.17	100	8	438	14.6	943	88.4	1.12	-	0.40	1
Total	36						-	23						-	118						-	0.64	59
Mean	6.7[a]	425	33.7	895	179.6	1.15		6.2[a]	400	41.2	779	226.7	1.19		6.1[a]	398	52.9	770	242.8	1.17			

[a] Indicates mean age.
[b] Maturity based on entire sample (includes fish of unknown len. and wt.).

Table A-12. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1977 (RRCSL 1978).

Age (Yr)	Males							Females							Combined							
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	190	-	100	-	1.46	-	-	1
2	-	-	-	-	-	-	-	1	238	-	-	-	1.34	0.0	4	240	7.0	180	8.2	1.31	-	-	3
3	-	-	-	-	-	-	-	3	251	44.7	180	111.5	1.35	66.7	8	252	29.9	214	74.1	1.29	-	-	5
4	-	-	-	-	-	-	-	8	302	29.2	223	95.7	1.21	87.5	9	303	27.9	346	91.8	1.21	-	-	1
5	8	393	23.9	813	139.0	1.32	100.0	3	353	48.7	339	215.7	1.19	100.0	27	363	37.6	627	203.4	1.26	-	0.38	16
6	17	409	34.5	861	180.1	1.25	100.0	20	383	32.1	547	191.0	1.25	100.0	53	390	38.1	767	208.6	1.26	-	1.18	16
7	14	410	28.0	866	155.1	1.25	100.0	10	400	32.1	721	184.6	1.26	100.0	38	408	25.8	863	152.0	1.26	-	0.71	14
8	15	442	27.0	1045	198.2	1.20	100.0	2	373	43.1	814	254.6	1.14	100.0	24	426	34.9	955	230.9	1.22	-	0.33	7
9	7	459	15.2	1169	140.3	1.21	100.0	1	430	-	610	-	1.07	100.0	10	457	21.6	1163	213.6	1.21	-	0.14	2
10	4	458	14.2	1138	82.2	1.18	100.0	-	-	-	850	-	-	-	5	458	12.3	1136	71.3	1.18	-	-	1
11	1	475	-	1390	-	1.30	100.0	-	-	-	-	-	-	-	1	475	-	1390	-	1.30	-	-	-
											-												
Total	66						100.0	48						93.8	180						-	0.73	66
Mean	7.2[a]	424	35.1	956	209.0	1.24		5.7[a]	360	57.4	622	260.7	1.24		6.3[a]	386	61.1	765	300.7	1.25			

[a] Indicates mean age.

Table A-13. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1978.

Age (Yr)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
4	4	358	4.8	425	64.5	0.93	75.0	2	371	12.0	425	106.1	0.83	100.0	6	362	9.3	425	68.9	0.89	83.3	0.50
5	17	392	12.1	596	96.7	0.99	94.1	6	397	13.6	617	116.9	0.98	100.0	23	393	12.4	601	100.0	0.99	95.7	0.35
6	21	419	17.2	758	153.7	1.02	100.0	12	408	14.4	667	148.2	0.97	100.0	33	415	16.9	725	155.9	1.00	100.0	0.57
7	32	435	16.3	897	136.1	1.09	100.0	26	426	14.7	924	180.2	1.20	100.0	58	431	16.2	909	156.5	1.14	100.0	0.81
8	18	446	17.2	950	131.7	1.07	94.4	12	442	20.0	1058	187.7	1.22	100.0	30	444	18.2	993	162.6	1.13	96.7	0.67
9	8	459	10.6	1101	183.6	1.13	100.0	2	436	6.4	1105	219.2	1.33	100.0	10	454	13.8	1102	177.7	1.17	100.0	0.25
10	1	451	-	1150	-	1.25	100.0	1	440	-	1120	-	1.31	100.0	2	446	7.8	1135	21.2	1.28	100.0	1.00
Total	101						97.1	61						100.0	162						98.2	0.60
Mean	6.7[a]	425	28.4	827	212.8	1.05		6.8[a]	421	22.5	863	242.1	1.13		6.8[a]	424	26.4	840	224.2	1.08		

[a] Indicates mean age.

Table A-14. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for Arctic grayling caught by angling from the Brabant Island area, 1965-78.

Age (Yr)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
1	3	161	11.0	47	16.7	1.11	-	5	171	11.6	63	12.5	1.27	-	10	167	14.4	58	21.9	1.20	-	1.67	2
2	24	236	13.9	169	36.0	1.27	-	17	229	15.8	161	37.9	1.32	-	46	233	14.7	165	35.6	1.29	-	0.71	5
3	34	290	19.9	319	74.2	1.29	-	23	282	23.2	295	64.7	1.30	-	78	285	23.8	306	80.1	1.29	-	0.68	21
4	35	331	25.3	449	109.4	1.23	-	24	323	33.2	421	131.5	1.22	-	72	327	26.4	439	110.4	1.24	-	0.69	13
5	69	383	26.6	679	141.7	1.21	-	45	366	29.9	616	137.1	1.24	-	138	372	30.5	634	149.7	1.22	-	0.65	24
6	165	410	23.5	822	131.4	1.19	-	104	396	23.9	741	138.1	1.18	-	313	404	26.4	789	145.0	1.19	-	0.63	44
7	166	428	21.7	928	131.7	1.19	-	84	418	22.0	902	156.3	1.23	-	283	424	22.2	920	140.6	1.20	-	0.51	33
8	168	444	18.9	1041	137.1	1.19	-	61	432	20.9	1002	149.4	1.24	-	239	439	20.9	1250	144.4	1.20	-	0.36	10
9	110	454	15.4	1112	130.1	1.19	-	15	449	11.6	1098	151.2	1.21	-	128	454	15.5	1113	137.4	1.19	-	0.14	3
10	27	464	15.3	1210	121.1	1.21	-	3	450	13.4	1205	78.9	1.33	-	31	463	15.3	1207	115.5	1.22	-	0.11	1
11	6	474	11.3	1290	73.6	1.21	-	-	-	-	-	-	-	-	6	474	11.3	1290	73.6	1.21	-	-	-
12	2	494	7.8	1446	120.2	1.20	-	1	479	-	1191	-	1.08	-	3	489	10.0	1361	170.0	1.16	-	0.50	-
Total	809						-	382						-	1347						-	0.47	156
	a							a							a								
Mean	6.8	412	56.6	875	279.3	1.20		6.0	384	63.3	741	289.2	1.22		6.4	399	62.0	813	294.6	1.21			

[a] Indicates mean age.

Table A-15. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1972 (Gillman and Dahlke 1973).

Length Interval (mm)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
560-579	1	570	-	1250	-	0.68	100.0	-	-	-	-	-	-	-	1	570	-	1250	-	0.68	100.0	-
600-619	1	610	-	1500	-	0.66	100.0	-	-	-	-	-	-	-	1	610	-	1500	-	0.66	100.0	-
620-639	1	620	-	1575	-	0.66	100.0	3	628	5.8	1682	286.4	0.68	100.0	4	626	6.3	1655	239.8	0.67	100.0	3.00
640-659	1	655	-	1875	-	0.67	100.0	1	645	-	1650	-	0.62	100.0	2	650	7.1	1763	159.1	0.64	100.0	1.00
660-679	1	667	-	2350	-	0.79	100.0	6	667	7.1	1925	210.7	0.65	100.0	7	667	6.5	1986	250.6	0.67	100.0	6.00
680-699	1	680	-	2750	-	0.88	100.0	2	685	0.0	1625	671.8	0.51	100.0	3	683	2.9	2000	804.7	0.63	100.0	2.00
700-719	1	700	-	2350	-	0.69	100.0	2	713	3.5	2450	70.7	0.67	100.0	3	708	7.6	2417	76.4	0.68	100.0	2.00
720-739	1	720	-	2450	-	0.66	100.0	3	725	8.7	2803	356.4	0.74	100.0	4	724	7.5	2715	340.4	0.72	100.0	3.00
740-759	1	740	-	2600	-	0.64	100.0	1	755	-	2150	-	0.50	100.0	2	748	10.6	2375	318.2	0.57	100.0	1.00
760-779	3	765	5.0	2758	469.3	0.62	100.0	1	775	-	2700	-	0.58	100.0	4	768	6.5	2744	384.3	0.61	100.0	0.33
780-799	1	780	-	3200	-	0.67	100.0	-	-	-	-	-	-	-	1	780	-	3200	-	0.67	100.0	-
800-819	2	810	7.1	2863	548.0	0.54	100.0	3	804	5.5	2950	477.0	0.57	100.0	5	806	6.3	2915	437.2	0.56	100.0	1.50
820-839	1	835	-	3825	-	0.66	100.0	2	828	10.7	3500	141.4	0.62	100.0	3	830	8.7	3608	212.6	0.63	100.0	2.00
840-859	1	850	-	3150	-	0.51	100.0	1	855	-	4050	-	0.65	100.0	2	853	3.5	3600	636.4	0.58	100.0	1.00
860-879	3	870	8.7	4283	464.6	0.65	100.0	3	870	5.0	4408	118.2	0.67	100.0	6	870	6.3	4346	310.8	0.66	100.0	1.00
880-899	1	880	-	4725	-	0.69	100.0	4	887	2.9	4394	710.7	0.63	100.0	5	886	4.2	4460	633.1	0.64	100.0	4.00
900-919	1	915	-	4500	-	0.59	100.0	4	909	7.5	4963	643.4	0.66	100.0	5	910	7.1	4870	594.4	0.65	100.0	4.00
920-939	-	-	-	-	-	-	-	2	923	3.5	4613	795.5	0.59	100.0	2	923	3.5	4613	795.5	0.59	100.0	-
940-959	1	955	-	5975	-	0.69	100.0	5	949	6.5	5625	980.8	0.66	100.0	6	950	6.3	5683	888.8	0.66	100.0	5.00
960-979	1	975	-	6975	-	0.75	100.0	4	970	7.1	5569	337.5	0.61	100.0	5	971	6.5	5850	694.0	0.64	100.0	4.00
980-999	-	-	-	-	-	-	-	1	990	-	5512	-	0.57	100.0	1	990	-	5512	-	0.57	100.0	-
1000-1019	-	-	-	-	-	-	-	1	1000	-	6075	-	0.61	100.0	1	1000	-	6075	-	0.61	100.0	-
1020-1039	-	-	-	-	-	-	-	1	1035	-	7650	-	0.69	100.0	1	1035	-	7650	-	0.69	100.0	-
1060-1079	-	-	-	-	-	-	-	2	1073	3.5	7763	1431.9	0.63	100.0	2	1073	3.5	7763	1431.9	0.63	100.0	-
1100-1119	-	-	-	-	-	-	-	2	1100	0.0	7538	1750.1	0.57	100.0	2	1100	0.0	7538	1750.1	0.57	100.0	-
1120-1139	-	-	-	-	-	-	-	1	1130	-	11250	-	0.78	100.0	1	1130	-	11250	-	0.78	100.0	-
1160-1179	-	-	-	-	-	-	-	1	1170	-	9200	-	0.57	100.0	1	1170	-	9200	-	0.57	100.0	-
Total	24						100.0	56						100.0	80						100.0	2.29
Mean		778	110.4	3246	1406.1	0.66			857	146.3	4317	2216.7	0.63			832	140.1	3975	2048.9	0.64		

Table A-16. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1973.

Length Interval (mm)	Males						Females						Combined						F/M Ratio	No. Unknown
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K		
500-519	-	-	-	-	-	-	-	-	-	-	-	-	1	500	-	1000	-	1.80	-	1
520-539	-	-	-	-	-	-	-	-	-	-	-	-	1	529	-	1250	-	0.84	-	1
540-569	1	553	-	1240	-	0.73	-	-	-	-	-	-	2	551	2.8	1170	98.0	0.70	-	1
560-579	-	-	-	-	-	-	1	562	-	1280	-	0.72	1	562	-	1280	-	0.72	-	-
580-599	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600-619	-	-	-	-	-	-	2	617	2.1	1490	14.1	0.64	2	617	2.1	1490	14.1	0.64	-	-
620-639	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
640-659	2	651	1.4	1825	77.8	0.66	-	-	-	-	-	-	3	648	5.3	1800	70.0	0.66	-	1
660-679	2	662	2.1	2100	113.1	0.73	-	-	-	-	-	-	2	662	2.1	2100	113.1	0.73	-	-
680-699	4	689	8.4	2225	138.0	0.68	3	689	1.7	2293	442.9	0.70	7	689	6.0	2254	2761.1	0.69	0.75	-
700-719	-	-	-	-	-	-	3	711	5.0	2463	130.5	0.68	3	711	5.0	2463	130.5	0.68	-	-
720-739	4	728	8.1	2623	170.2	0.68	1	732	-	2940	-	0.75	5	729	7.3	2686	204.7	0.70	0.25	-
740-759	3	753	1.7	2903	257.0	0.68	3	752	3.8	2880	52.9	0.69	7	752	2.7	2953	222.0	0.70	1.00	1
760-779	5	772	4.1	2944	668.5	0.64	3	766	8.7	2973	402.7	0.66	8	770	6.5	2955	549.5	0.65	0.60	-
780-799	1	782	-	3640	-	0.76	4	787	7.6	3430	128.1	0.70	5	786	7.0	3472	145.3	0.72	4.00	-
800-819	2	804	2.1	2755	558.6	0.53	8	807	5.6	3516	335.3	0.67	10	806	5.2	3364	474.5	0.64	4.00	-
820-839	2	834	0.0	3600	169.7	0.62	2	825	0.7	4090	693.0	0.72	4	829	5.5	3845	500.0	0.68	1.00	-
840-859	4	850	9.3	4355	438.6	0.71	2	851	1.4	4370	127.3	0.71	6	850	7.2	4360	344.6	0.71	0.50	-
860-879	4	867	5.1	4570	525.7	0.70	3	876	2.3	4593	681.6	0.68	7	871	6.5	4580	541.5	0.69	0.75	-
880-899	2	889	7.1	4840	480.8	0.69	3	885	3.6	4467	41.6	0.64	5	887	4.9	4616	317.0	0.66	1.50	-
900-919	-	-	-	-	-	-	4	911	3.2	4673	423.1	0.62	5	911	2.8	4758	413.3	0.63	-	1
920-939	1	937	-	4510	-	0.55	3	929	7.9	6073	574.6	0.76	5	929	8.2	5570	828.6	0.70	3.00	1
940-959	-	-	-	-	-	-	3	943	1.0	5553	1081.5	0.66	5	945	3.2	5624	797.7	0.67	-	2
960-979	-	-	-	-	-	-	3	966	8.4	6600	440.0	0.73	4	967	6.9	6670	355.3	0.74	-	1
980-999	-	-	-	-	-	-	6	986	4.2	6398	360.4	0.67	6	986	4.2	6398	360.4	0.67	-	-
1000-1019	-	-	-	-	-	-	2	1005	7.1	6940	113.1	0.68	3	1008	7.6	7467	915.7	0.73	-	1
1020-1039	-	-	-	-	-	-	5	1030	7.5	7410	269.1	0.68	5	1030	7.5	7410	269.1	0.68	-	-
1040-1059	-	-	-	-	-	-	1	1050	-	10050	-	0.87	1	1050	-	10050	-	0.87	-	-
1080-1099	-	-	-	-	-	-	1	1080	-	9560	-	0.76	1	1080	-	9560	-	0.96	-	-
1120-1139	-	-	-	-	-	-	1	1130	-	9220	-	0.64	1	1130	-	9220	-	0.64	-	-
1180-1199	-	-	-	-	-	-	1	1184	-	13620	-	0.82	1	1184	-	13620	-	0.82	-	-
Total	36						67						115						1.86	10
Mean		779	78.1	3248	1024.8	0.67		869	128.6	4827	2279.9	0.69		832	132.4	4257	2129.1	0.69		

Table A-17. Mean length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1977 (RRCSL 1978).

Length Interval (mm)	Males							Females							Combined								
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
240-259	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	244	0.0	100	0.0	0.69	-	-	2
320-339	-	-	-	-	-	-	-	1	322	-	220	-	0.66	100.0	1	322	-	220	-	0.66	100.0	-	-
360-379	-	-	-	-	-	-	-	1	362	-	350	-	0.74	0.0	2	362	0.0	345	7.1	0.73	-	-	1
380-399	-	-	-	-	-	-	-	1	296	-	390	-	0.63	0.0	2	394	2.8	405	21.2	0.66	-	-	1
400-419	-	-	-	-	-	-	-	1	411	-	580	-	0.84	100.0	2	408	5.0	525	77.8	0.77	-	-	1
420-439	-	-	-	-	-	-	-	4	431	6.4	530	11.6	0.67	50.0	8	430	6.8	545	63.9	0.69	-	-	4
440-459	-	-	-	-	-	-	-	3	446	4.2	663	37.9	0.75	100.0	5	448	4.7	666	30.5	0.74	-	-	2
460-479	-	-	-	-	-	-	-	2	471	3.5	785	91.9	0.75	100.0	4	469	2.9	785	64.6	0.76	-	-	2
480-499	-	-	-	-	-	-	-	2	492	0.7	840	14.1	0.71	100.0	5	487	6.1	832	71.9	0.72	-	-	3
500-519	-	-	-	-	-	-	-	4	510	6.2	1003	52.5	0.76	100.0	6	510	6.8	1022	63.1	0.77	-	-	2
520-539	1	538	-	970	-	0.62	100.0	4	528	4.8	1078	148.4	0.74	100.0	7	530	6.5	1069	123.1	0.72	-	4.00	2
540-559	1	548	-	1320	-	0.80	100.0	-	-	-	-	-	-	-	4	544	4.6	1225	80.2	0.76	-	-	3
560-579	3	572	4.6	1357	196.3	0.72	100.0	3	566	6.6	1340	185.2	0.74	100.0	11	567	6.0	1242	214.4	0.68	-	1.00	5
580-599	2	590	2.1	1405	7.1	0.69	100.0	-	-	-	-	-	-	-	7	590	5.4	1434	44.7	0.70	-	-	5
600-619	-	-	-	-	-	-	-	2	614	6.4	1655	91.9	0.72	100.0	9	611	4.2	1588	180.8	0.70	-	-	7
620-639	-	-	-	-	-	-	-	1	637	-	1840	-	0.71	100.0	5	631	7.1	1832	106.4	0.73	-	-	4
640-659	2	645	6.4	2085	134.4	0.78	100.0	2	650	0.0	1600	0.0	0.58	100.0	20	648	6.1	1973	312.4	0.72	-	1.00	16
660-679	4	670	0.0	2028	307.8	0.67	100.0	5	670	5.7	2086	165.8	0.70	100.0	21	669	6.5	2054	203.4	0.69	-	1.25	12
680-699	2	690	7.1	2170	240.4	0.66	100.0	4	691	1.0	2113	400.8	0.64	100.0	12	691	5.2	2101	239.9	0.64	-	2.00	6
700-719	6	712	6.3	2300	246.5	0.64	100.0	1	718	-	2720	-	0.74	100.0	19	712	5.3	2363	227.7	0.65	-	0.17	12
720-739	8	728	4.7	2844	231.6	0.74	100.0	-	-	-	-	-	-	-	13	727	6.0	2763	260.2	0.72	-	-	5
740-759	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	748	7.5	2847	172.6	0.68	-	-	6
760-779	1	744	-	3090	-	0.67	100.0	-	-	-	-	-	-	-	8	769	5.5	3018	87.0	0.66	-	-	7
780-799	1	788	-	3500	-	0.72	100.0	1	792	-	3740	-	0.75	100.0	6	788	2.6	3387	196.8	0.69	-	1.00	4
800-819	4	811	5.4	3980	202.0	0.75	100.0	-	-	-	-	-	-	-	8	809	6.6	3728	445.5	0.70	-	-	4
820-839	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	821	0.0	4680	0.0	0.85	-	-	2
840-859	1	858	-	4480	-	0.71	100.0	-	-	-	-	-	-	-	3	854	3.5	4707	196.3	0.76	-	-	2
860-879	1	865	-	5010	-	0.77	100.0	-	-	-	-	-	-	-	3	863	1.7	4450	485.0	0.69	-	-	2
880-899	1	898	-	5340	-	0.74	100.0	-	-	-	-	-	-	-	7	891	7.6	4983	366.5	0.71	-	-	6
900-919	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	905	2.7	5280	181.0	0.71	-	-	8
920-939	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	920	0.0	5420	0.0	0.63	-	-	2
940-959	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	950	0.0	5420	0.0	0.63	-	-	2
960-979	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	978	0.0	7700	0.0	0.82	-	-	2
980-999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	988	6.3	7217	785.7	0.75	-	-	6
1000-1019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1005	-	9000	-	0.89	-	-	1
Total	38						100.0	42						90.0	229						-	1.11	149
Mean		707	88.9	2623	1062.3	0.71			550	112.9	1308	760.1	0.71			673	151.6	2480	1675.6	0.70			

Table A-18. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1978.

Length Interval (mm)	Males							Females							Combined							
		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%		Length(mm)		Weight(g)			%	F/M	No.
	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	N	Mean	SD	Mean	SD	K	Mat.	Ratio	Unknown
560-579	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	560	-	950	-	0.54	-	-	1
580-599	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600-619	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	605	-	1100	-	0.50	-	-	1
620-639	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	620	-	1200	-	0.50	-	-	1
640-659	1	655	-	1400	-	0.50	100.0	-	-	-	-	-	-	-	2	652	4.9	1375	35.3	0.50	-	-	1
660-669	1	665	-	1450	-	0.49	100.0	-	-	-	-	-	-	-	1	665	-	1450	-	0.49	100.0	-	-
680-699	1	685	-	2440	-	0.76	100.0	1	682	-	1550	-	0.49	0.0	2	684	2.1	1995	629.3	0.62	50.0	1.00	-
700-719	-	-	-	-	-	-	-	2	715	-	2150	70.7	0.59	100.0	2	715	-	2150	70.7	0.59	100.0	-	-
720-739	1	732	-	2450	-	0.62	100.0	3	724	5.2	2200	173.2	0.58	66.7	4	726	5.8	2263	188.7	0.59	75.0	3.00	-
740-759	2	749	9.2	2625	318.2	0.62	100.0	9	750	5.4	2694	375.4	0.64	66.7	12	749	6.0	2654	348.7	0.63	-	4.50	1
760-779	4	766	4.4	2750	216.0	0.61	75.0	7	770	5.3	2850	421.3	0.62	57.1	11	768	5.2	2814	350.8	0.62	63.6	1.75	-
780-799	1	782	-	3350	-	0.70	100.0	7	790	6.2	3021	394.6	0.61	100.0	9	788	6.8	3089	367.2	0.63	-	7.00	1
800-819	5	805	1.1	3380	448.1	0.65	100.0	6	808	4.9	3008	439.8	0.57	100.0	11	807	3.9	3177	463.3	0.60	100.0	1.20	-
820-839	2	832	9.9	4450	777.8	0.77	100.0	7	831	5.7	3557	304.7	0.62	85.7	9	832	6.0	3756	547.9	0.65	88.9	3.50	-
840-859	4	849	0.8	3938	446.1	0.64	100.0	2	856	1.4	4250	212.1	0.68	100.0	6	851	3.7	4042	406.7	0.65	100.0	0.50	-
860-879	4	870	6.5	4550	911.0	0.69	100.0	4	866	5.2	4175	250.2	0.64	100.0	8	868	5.8	4363	637.4	0.67	100.0	1.00	-
880-899	5	888	2.3	4770	558.6	0.68	100.0	4	885	5.4	4238	265.8	0.61	100.0	9	886	4.1	4533	511.1	0.65	100.0	0.80	-
900-919	2	911	1.4	5075	106.1	0.67	100.0	5	904	6.5	5080	371.8	0.69	100.0	7	906	6.4	5079	306.7	0.68	100.0	2.50	-
920-939	1	920	-	4850	-	0.62	100.0	3	927	6.8	5117	775.1	0.64	100.0	4	926	6.7	5050	646.8	0.64	100.0	3.00	-
940-959	1	950	-	6700	-	0.78	100.0	3	951	6.5	5683	828.2	0.66	100.0	4	951	5.4	5938	845.9	0.69	100.0	3.00	-
960-979	-	-	-	-	-	-	-	5	971	3.8	6150	603.1	0.67	100.0	5	971	3.7	6150	603.1	0.67	100.0	-	-
980-999	1	992	-	5400	-	0.55	100.0	8	987	4.7	6469	507.0	0.67	100.0	9	988	4.7	6350	593.2	0.66	100.0	8.00	-
1000-1019	-	-	-	-	-	-	-	1	1010	-	7000	-	0.68	100.0	1	1010	-	7000	-	0.68	100.0	-	-
1020-1039	-	-	-	-	-	-	-	3	1024	5.5	7683	951.8	0.72	100.0	3	1024	5.5	7683	951.8	0.72	100.0	-	-
1040-1059	-	-	-	-	-	-	-	3	1051	5.6	7000	804.7	0.60	100.0	3	1051	5.6	7000	804.7	0.60	100.0	-	-
1060-1079	-	-	-	-	-	-	-	4	1065	7.1	7825	1086.7	0.65	100.0	4	1065	7.1	7825	1086.7	0.65	100.0	-	-
1080-1099	-	-	-	-	-	-	-	1	1095	-	8950	-	0.68	100.0	1	1095	-	8950	-	0.68	100.0		-
Total	36						97.2	88						89.8	130						-	2.44	6
Mean		827	77.5	3834	1223.8	0.66			873	108.1	4483	1884.1	0.64			850	109.5	4175	1792.7	0.64			

Table A-19. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by length interval for northern pike caught by angling from the Beaver Lake area, 1972-78.

Length Interval (mm)	Males						Females						Combined						F/M Ratio	No. Unknown
		Length(mm)		Weight(g)				Length(mm)		Weight(g)				Length(mm)		Weight(g)				
	N	Mean	SD	Mean	SD	K	N	Mean	SD	Mean	SD	K	N	Mean	SD	Mean	SD	K		
240-259	-	-	-	-	-	-	-	-	-	-	-	-	2	244	0.0	100	0.0	0.69	-	2
320-339	-	-	-	-	-	-	1	322	-	220	-	0.66	1	322	-	220	-	0.66	-	-
360-379	-	-	-	-	-	-	1	362	-	350	-	0.74	2	362	0.0	345	7.1	0.73	-	1
380-399	-	-	-	-	-	-	1	396	-	390	-	0.63	2	394	2.8	405	21.2	0.66	-	1
400-419	-	-	-	-	-	-	1	411	-	580	-	0.84	2	408	5.0	525	77.8	0.77	-	1
420-439	-	-	-	-	-	-	4	431	6.4	530	11.6	0.66	8	430	6.8	545	63.9	0.69	-	4
440-459	-	-	-	-	-	-	3	446	4.2	663	37.9	0.75	5	448	4.7	666	30.5	0.74	-	2
460-479	-	-	-	-	-	-	2	471	3.5	785	91.9	0.75	4	469	2.9	785	64.6	0.76	-	2
480-499	-	-	-	-	-	-	2	492	0.7	840	14.1	0.71	5	487	6.1	832	71.9	0.72	-	3
500-519	-	-	-	-	-	-	4	510	6.2	1003	52.5	0.76	7	509	7.3	1019	58.2	0.77	-	3
520-539	1	538	-	970	-	0.62	4	528	4.8	1078	148.4	0.74	8	529	6.1	1091	130.8	0.74	4.00	3
540-559	2	551	3.5	1280	56.6	0.77	-	-	-	-	-	-	6	546	5.2	1207	81.4	0.74	-	4
560-579	4	572	4.0	1330	168.9	0.71	4	565	5.7	1325	154.2	0.73	14	566	5.8	1224	204.2	0.67	1.00	6
580-599	2	590	2.1	1405	7.1	0.69	-	-	-	-	-	-	7	590	5.4	1434	44.7	0.70	-	5
600-619	1	610	-	1500	-	0.66	4	615	4.2	1573	109.4	0.68	13	612	4.4	1529	200.1	0.67	4.00	8
620-639	1	620	-	1575	-	0.66	4	631	6.4	1721	246.9	0.69	10	628	7.1	1698	250.1	0.68	4.00	5
640-659	6	650	5.6	1849	260.4	0.67	3	648	2.9	1617	28.9	0.59	27	649	5.8	1894	317.2	0.69	0.50	18
660-679	8	667	3.9	2014	325.9	0.68	11	668	6.4	1998	200.6	0.67	31	668	6.4	2022	230.0	0.68	1.38	12
680-699	8	688	7.0	2304	237.0	0.71	10	688	3.2	2013	484.9	0.62	24	689	5.6	2124	360.3	0.65	1.25	6
700-719	7	710	7.3	2307	225.8	0.65	8	714	3.9	2414	202.5	0.67	27	712	5.3	2364	207.0	0.66	1.14	12
720-739	14	728	5.8	2724	243.1	0.71	7	726	6.5	2564	413.3	0.67	26	726	6.2	2664	298.0	0.70	0.50	5
740-759	6	749	6.6	2760	267.2	0.66	13	751	4.9	2695	357.4	0.64	27	749	6.0	2754	317.4	0.65	2.17	8
760-779	13	769	5.4	2853	459.6	0.63	11	769	6.2	2870	381.2	0.63	31	769	5.6	2894	372.1	0.64	0.85	7
780-799	4	783	3.5	3423	189.8	0.71	12	789	6.3	3218	393.8	0.65	21	787	5.8	3271	311.7	0.67	3.00	5
800-819	13	808	4.8	3389	598.2	0.64	17	807	5.2	3237	460.6	0.62	34	807	5.2	3323	514.0	0.63	1.31	4
820-839	5	833	5.1	3985	589.1	0.69	11	830	6.2	3644	393.6	0.64	18	830	6.5	3854	535.5	0.68	2.20	2
840-859	10	850	6.0	4080	541.4	0.66	5	854	2.8	4258	180.1	0.68	17	852	5.0	4219	480.3	0.68	0.50	2
860-879	12	868	6.0	4528	615.8	0.69	10	870	6.2	4371	385.2	0.66	24	869	6.1	4433	501.9	0.68	0.83	2
880-899	9	888	5.4	4844	469.9	0.69	11	886	4.0	4357	427.7	0.63	26	888	5.5	4656	489.3	0.67	1.22	6
900-919	3	912	2.5	4883	340.4	0.64	13	908	6.4	4919	475.4	0.66	25	908	5.3	5037	403.3	0.67	4.33	9
920-939	2	929	12.0	4680	240.4	0.59	8	927	6.4	5349	871.4	0.67	13	926	6.8	5313	758.9	0.67	4.00	3
940-959	2	953	3.5	6338	512.7	0.73	11	948	6.1	5621	870.9	0.66	17	949	5.2	5695	752.2	0.67	5.50	4
960-979	1	975	-	6975	-	0.75	12	970	5.9	6069	602.8	0.67	16	971	6.0	6380	785.2	0.70	12.00	3
980-999	1	992	-	5400	-	0.55	15	987	4.4	6377	483.1	0.66	22	987	4.8	6562	716.8	0.68	15.00	6
1000-1019	-	-	-	-	-	-	4	1005	5.8	6739	448.2	0.66	6	1007	6.1	7413	1110.4	0.73	-	2
1020-1039	-	-	-	-	-	-	9	1028	7.1	7528	531.3	0.69	9	1028	7.1	7528	531.3	0.69	-	-
1040-1059	-	-	-	-	-	-	4	1051	4.6	7763	1660.5	0.67	4	1051	4.6	7763	1660.5	0.67	-	-
1060-1079	-	-	-	-	-	-	6	1068	6.9	7804	1058.1	0.64	6	1066	6.9	7804	1058.1	0.64	-	-
1080-1099	-	-	-	-	-	-	2	1088	10.6	9255	431.3	0.72	2	1088	10.6	9255	431.3	0.72	-	-
1100-1119	-	-	-	-	-	-	2	1100	0.0	7538	1750.1	0.57	2	1100	0.0	7538	1750.1	0.57	-	-
1120-1139	-	-	-	-	-	-	2	1130	0.0	10235	1435.4	0.71	2	1130	0.0	10235	1435.4	0.71	-	-
1160-1179	-	-	-	-	-	-	1	1170	-	9200	-	0.57	1	1170	-	9200	-	0.57	-	-
1180-1199	-	-	-	-	-	-	1	1184	-	13620	-	0.82	1	1184	-	13620	-	0.82	-	-
Total	135						254						555						1.88	166
Mean		770	99.1	3213	1244.4	0.67		815	170.5	4014	2289.6	0.66		771	159.5	3464	2032.7	0.68		

Table A-20. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1972 (Falk and Dahlke 1973).

Age (Yr)	Males							Females							Combined							F/M Ratio
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	
9	3	600	26.5	1442	170.2	0.66	100.0	2	664	5.0	1820	325.3	0.62	100.0	5	625	39.6	1593	289.6	0.65	100.0	0.67
10	-	-	-	-	-	-	-	3	667	48.1	1702	715.4	0.54	100.0	3	677	48.1	1702	715.4	0.54	100.0	-
11	4	678	59.5	2563	694.8	0.87	100.0	5	656	21.4	1882	242.6	0.66	100.0	9	666	41.4	2184	582.3	0.76	100.0	1.25
12	6	751	61.3	2850	578.1	0.68	100.0	10	811	84.1	3198	1053.1	0.58	100.0	16	788	80.0	3067	898.3	0.62	100.0	1.67
13	3	820	52.7	3458	1071.3	0.62	100.0	9	860	76.9	4199	901.2	0.65	100.0	12	850	71.6	4014	954.7	0.65	100.0	3.00
14	5	866	105.0	4625	1814.5	0.68	100.0	8	957	90.8	5219	1382.1	0.59	100.0	13	922	103.0	4990	1517.3	0.62	100.0	1.60
15	3	873	36.2	3875	680.5	0.58	100.0	3	922	22.6	5525	338.2	0.71	100.0	6	898	37.8	4700	1023.6	0.64	100.0	1.00
16	2	996	164.1	7200	3500.2	0.70	100.0	3	932	43.1	5800	1249.0	0.72	100.0	5	957	94.3	6360	2104.9	0.71	100.0	1.33
17	-	-	-	-	-	-	-	7	1056	56.1	7200	1292.5	0.61	100.0	7	1056	56.1	7200	1292.5	0.61	100.0	-
18	-	-	-	-	-	-	-	1	1170	-	9200	-	0.57	100.0	1	1170	-	9200	-	0.57	100.0	-
19	-	-	-	-	-	-	-	2	1115	21.2	10013	1750.1	0.72	100.0	2	1115	21.2	10013	1750.1	0.72	100.0	-
Total	26						100.0	53						100.0	79						100.0	2.04
Mean	12.7[a]	785	128.7	3508	1840.8	0.69		13.6[a]	877	151.3	4590	234.4	0.63		13.3[a]	847	149.9	4234	2232.5	0.65		

[a] Indicates mean age.

Table A-21. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1973.

Age (Yr)	Males						Females						Combined						F/M Ratio	No. Unknown
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K		
5	-	-	-	-	-	-	-	-	-	-	-	-	2	515	20.5	1125	176.8	0.82	-	2
6	-	-	-	-	-	-	1	618	-	1480	-	0.63	1	618	-	1480	-	0.63	-	-
7	-	-	-	-	-	-	2	589	37.5	1390	155.6	0.68	3	575	35.0	1293	200.3	0.68	-	1
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	6	714	39.8	2522	329.6	0.69	4	728	30.9	2578	416.7	0.66	10	720	35.3	2544	345.1	0.68	0.67	-
10	5	699	50.2	2092	309.4	0.62	6	758	74.8	3147	847.3	0.72	11	731	68.8	2667	837.0	0.67	1.20	-
11	6	751	70.7	2703	759.3	0.63	14	788	41.5	3392	656.2	0.69	21	770	59.4	3117	788.6	0.67	2.33	1
12	7	807	49.3	3644	678.7	0.69	6	865	48.6	4550	760.4	0.70	14	842	61.9	4161	880.0	0.69	0.86	1
13	5	812	65.0	3656	835.3	0.68	14	907	78.4	5019	1350.1	0.66	21	885	81.2	4703	1298.1	0.66	2.80	2
14	5	860	58.0	4174	664.7	0.66	5	952	16.7	6464	509.4	0.75	10	906	62.9	5319	1329.8	0.70	1.00	-
15	1	894	-	5180	-	0.73	9	980	55.9	6271	1862.0	0.65	10	972	59.4	6162	1420.9	0.66	9.00	-
16	1	865	-	5260	-	0.81	3	1024	35.0	7903	1899.5	0.73	6	986	67.2	7395	1678.1	0.76	3.00	2
17	-	-	-	-	-	-	3	1131	52.0	10800	2448.1	0.74	4	1085	101.9	9605	3115.7	0.73	-	1
Total	36						67						113						1.86	10
Mean	11.7[a]	779	78.1	3248	1024.8	0.67	12.4	869	128.6	4827	2279.9	0.69	12.1[a]	834	130.5	4270	2123.7	0.68		

[a] Indicates mean age.

Table A-22. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1978.

Age (Yr)	Males							Females							Combined							F/M Ratio	No. Unknown
	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.	N	Length(mm) Mean	SD	Weight(g) Mean	SD	K	% Mat.		
5	-	-	-	-	-	-	-	2	546	6.4	875	35.4	0.54	0.0	3	575	51.3	875	35.4	-	-	-	1
6	2	584	19.1	1100	70.7	0.55	0.0	2	530	42.4	900	282.8	0.59	0.0	12	539	37.6	1000	204.1	-	-	1.00	8
7	2	651	26.9	1525	318.2	0.55	50.0	3	654	46.9	1650	396.9	0.58	66.7	23	601	51.8	1600	329.8	-	-	1.50	18
8	4	613	52.0	1188	497.3	0.53	75.0	5	729	21.5	2380	525.1	0.61	80.0	45	632	63.3	1850	791.0	-	-	1.25	36
9	7	703	66.3	2100	807.3	0.58	100.0	7	751	37.3	2493	641.9	0.57	86.0	61	666	61.3	2296	729.7	-	-	1.00	47
10	4	767	91.2	2688	770.7	0.59	100.0	14	773	38.7	2893	510.6	0.62	57.0	55	726	62.6	2847	558.5	-	-	3.50	37
11	3	798	53.9	3200	957.9	0.62	100.0	11	822	46.0	3527	846.3	0.63	100.0	34	770	83.8	3457	843.5	-	-	3.67	20
12	7	763	44.9	2941	531.8	0.66	100.0	13	861	51.5	3973	803.0	0.62	100.0	36	800	76.4	3612	866.9	-	-	1.86	16
13	7	848	44.3	4264	649.8	0.70	100.0	10	866	91.5	4235	1354.2	0.64	100.0	21	851	70.1	4247	1090.9	-	-	1.43	4
14	3	889	56.3	5700	888.8	0.81	100.0	7	979	39.7	6393	1041.4	0.68	100.0	18	922	77.9	6185	1005.3	-	-	2.33	8
15	5	875	40.5	4490	963.3	0.66	100.0	11	994	53.4	6386	1103.0	0.65	100.0	19	940	86.4	5794	1372.1	-	-	2.20	3
16	4	869	23.2	4288	586.5	0.65	100.0	9	1000	60.4	7167	1214.5	0.71	100.0	14	958	78.0	6281	1726.9	-	-	2.25	1
17	-	-	-	-	-	-	-	1	1056	-	7850	-	0.67	100.0	1	1056	-	7850	-	0.67	100.0	-	-
18	-	-	-	-	-	-	-	1	1020	-	6700	-	0.63	100.0	1	1020	-	6700	-	0.63	100.0	-	-
Total	48						90.0	96						85.0	343						-	2.00	199
Mean	11.5[a]	773	104.7	3171	1453.1	0.63		12.4[a]	850	129.6	4421	2010.9	0.63		10.4[a]	740	133.1	3871	1904.5	-			

[a] Indicates mean age.

Table A-23. Mean fork length, mean weight, condition factor (K), maturity and sex ratio by age group for northern pike caught by angling from the Beaver Lake area, 1972-78.

Age (yr)	Males						Females						Combined						F/M Ratio	No. Unknown
	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K	N	Length(mm) Mean	Length(mm) SD	Weight(g) Mean	Weight(g) SD	K		
5	-	-	-	-	-	-	2	546	6.4	875	35.4	0.54	5	551	50.2	1000	178.0	-	-	3
6	2	584	19.1	1100	70.7	0.55	3	559	59.0	1093	390.0	0.61	13	545	42.2	1096	278.1	-	1.33	8
7	2	651	26.9	1525	318.2	0.55	5	628	52.3	1546	324.2	0.62	26	598	50.2	1485	314.3	-	2.50	19
8	4	613	52.0	1188	497.3	0.53	5	729	21.5	2380	525.1	0.61	45	632	63.3	1850	791.0	-	1.25	36
9	16	688	65.6	2135	676.2	0.64	13	730	43.8	2415	574.1	0.61	76	671	60.9	2261	637.5	-	0.81	47
10	9	729	75.1	2357	607.5	0.61	23	756	58.4	2804	752.7	0.64	69	724	63.1	2678	734.2	-	2.56	37
11	13	739	75.1	2775	759.4	0.70	30	778	70.1	3190	897.8	0.66	64	755	80.0	3035	883.3	-	2.31	21
12	20	775	54.8	3160	676.1	0.68	29	845	66.7	3825	999.7	0.62	66	806	75.9	3591	962.5	-	1.45	17
13	15	830	52.4	3900	820.8	0.68	33	882	81.5	4558	1273.3	0.65	54	864	75.4	4383	1168.2	-	2.20	6
14	13	869	73.9	4700	1320.6	0.70	20	963	61.2	5941	1211.5	0.66	41	918	81.9	5452	1380.2	-	1.54	8
15	9	877	34.5	4362	873.3	0.64	23	979	55.1	6229	1192.2	0.66	35	942	75.6	5704	1390.3	-	2.56	3
16	7	905	93.0	5259	2024.6	0.69	15	991	59.7	7041	1442.5	0.72	25	965	76.6	6576	1781.3	-	2.14	3
17	-	-	-	-	-	-	11	1076	60.6	8241	2222.5	0.65	12	1066	69.0	8056	2213.9	-	-	1
18	-	-	-	-	-	-	2	1095	106.1	7950	1767.8	0.60	2	1095	106.1	7950	1767.8	-	-	-
19	-	-	-	-	-	-	2	1115	21.2	10013	1750.1	0.72	2	1115	21.2	10013	1750.1	-	-	-
Total	110						216						535						1.96	209
Mean	11.8[a]	778	102.5	3276	1429.3	0.66	12.4[a]	863	134.8	4499	2184.2	0.65	11.2[a]	776	143.0	4090	2062.1	-		

[a] Indicates mean age.